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TRADE FLOWS AND MARKETING PRACTICES
OF LOUISIANA AND GULF STATES NURSERIES

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Master of Science

in

The Department of Agricultural Economics and Agribusiness

By
Wade R. Hampton
B.A., University of Florida, 1994
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Abstract

The markets facing nursery producers have changed dramatically in the past decade. These changes in nursery markets have outdated previous research. New research into nursery marketing will assist nursery producers in making marketing decisions. Nursery producers can market their plants to five different marketing channels: Mass-merchandisers, garden centers, other retailers, landscapers and re-wholesalers. This study described the 1998 Louisiana nursery industry, analyzed nursery market changes over the past decade in Louisiana and the Southeast and analyzed characteristics of Louisiana and Southeastern nurseries to estimate marketing channel choice. Data was collected via mail using the third Trade Flows and Marketing Practices survey. Non-respondents to the mail survey were contacted by telephone to obtain survey information. The resulting data set was compiled and tabulated to form a description of the 1998 Louisiana nursery industry. Data from the 1998 TFMP survey was compared with data from the 1988 and 1993 surveys. An analysis of variance for each of the marketing channels was performed to determine if and how marketing channel use had changed over the decade. In order to estimate marketing channel use, a model was designed with the proportion of sales through each channel as a function of a set of market oriented variables such as sales, acreage, age, contract sales, transaction methods, in-state sales and sales to four or more marketing channels. A system of five equations was designed to estimate marketing channel use, one equation for each marketing channel. Analysis of the Louisiana nursery market over the past decade showed that Louisiana nurseries have increased sales to retailers and re-wholesalers at the expense of landscapers. Analysis of nursery marketing channel choice revealed that nurseries have little market power to make marketing decisions. It appears that the retailers and the market dictate marketing decisions in the nursery industry.

Chapter 1

Introduction

The nursery industry is an important economic component of both Louisiana and United States agriculture. Consumer spending on lawn and garden products has steadily increased over the last decade. From 1990 to 1998, consumer spending on lawn and garden products jumped from \$20.8 billion to \$30.2 billion, an increase of 45% (National Gardening Survey, 1999). In 1998, 63% of all households in the South purchased nursery goods, while 65% of all U.S. households purchased nursery products (National Gardening Survey, 1999). Much of the increase in consumer spending has come from the entry and expansion of mass-merchandisers in nursery plant retailing. Purchasing lawn and garden products is now both more convenient and cheaper for most consumers.

Nursery production in the United States is categorized as floriculture or environmental horticulture. Floriculture consists of cut flowers, potting flowers and other plants typically grown in a greenhouse environment. Environmental horticulture encompasses trees, shrubs, and other plants that are typically grown outdoors. Nursery and ornamental plant producers had sales totaling \$12.1 billion in 1998, about 12% of total farm crop cash receipts (ERS, 1999). In terms of total farm crop cash receipts, environmental horticulture and floriculture rank seventh among United States agricultural products (ERS, 1999). However, in terms of total economic output, a measure of both the industry's economic value and the value of its associated industries, activity in environmental horticulture and floriculture ranked second to beef (ERS, 1999). Environmental horticulture and floriculture ranked eleventh in total 1998 cash receipts in Louisiana (ERS, 1999).

The Economic Research Service's (ERS) 1999 Floriculture and Environmental Horticulture Briefing Room web site provides an overview and projects trends for the United States nursery industry. The site outlines the general importance of the nursery industry to United States agriculture. The United States is both the world's largest producer and consumer of nursery products. All states reported commercial nursery production with 42 states listing floriculture and environmental crops as one of their top ten commodities in terms of grower cash receipts. Total United States grower cash receipts for the nursery industry have increased at about 5% per year since 1989. The West and South were listed as the top nursery producing regions in the country.

Other studies have detailed the economic importance of the nursery industry, both at the national and state level. Johnson (1992) looked at the economic factors affecting nursery sales. Data for nursery sales estimates were obtained from the USDA's Floriculture and Environmental Horticulture Products. Domestic sales of nursery plants were hypothesized to be a function of economic factors such as GNP, changes in the inflation rate, and the change in construction starts. Increases in GNP had a significant and positive impact on nursery sales, while increasing inflation rates had a significant and negative impact on nursery sales. Increases in construction and the necessity to enhance this new construction had a significant and positive impact on nursery sales.

Taverneir (1995) examined the economic impact of the nursery industry on a state's economy in terms of employment, employee compensation and industry output. The article used the New Jersey IMPLAN database to estimate the demand for greenhouse, nursery and sod products in New Jersey. The economic impact of the nursery industry was categorized three

ways: a direct impact, with homeowners, real estate operators and others who buy nursery products; an indirect impact, as nursery sector sales increase, the nursery sector increases its demand for inputs, such as chemicals and labor; and an induced impact, where households spend more on nursery industry products from the increase labor input.

Harris (1992) looked at the economic linkages of the nursery industry. Input-output analysis was used to estimate the forward and backward linkages of the nursery industry. The survey defined backward linkage as 'economic activities by sectors other than the nursery industry that are necessary to meet the input purchases by the nursery sector.' The paper cited the national food and fiber industry as having only 11% of its total economic output a result of backward linkages. In the case of the nursery industry, inputs such as herbicides, pesticides and fertilizers created the strong backward linkages. The analysis found that 45% of the nursery industry's total economic impact occurred from backward linkages. Forward linkages were defined as 'activities associated with economic sectors other than the greenhouse and nursery products sector necessary to process and distribute the output of the nursery industry.' Examples of services and products that would have strong forward linkage in the nursery sector are transportation and trade. The paper found that 55% of the nursery sector's total economic impact was from forward linkages.

Problem Statement

The markets for nursery products have changed dramatically over the past ten years. Both general mass-merchandisers and home centers have experienced rapid expansion over the last decade. Home Depot increased its number of stores from 96 in 1988 to 960 in 1999. Wal-mart grew from 1,116 in 1988 to 2,304 in 1998. Mass-merchandiser's and home center's lawn and garden market share has also increased. While other retail outlets have had fewer customers, lawn and garden centers at mass merchandisers and home centers had two million more customers in 1998 than in 1997 (National Gardening Survey, 1999).

As retail entities increase in size, production nurseries have grown to better serve them. For a nursery to expand both production and sales either its base market must grow, its market share must grow or both. The marketing channels available to nurseries are landscapers, garden centers, mass-merchandisers/home centers, re-wholesalers and "other" retail firms. While production nurseries can engage in direct retail sales, this practice is generally found only at smaller nurseries (Hinson and Turner, 1994). By expanding both the size and scope of their production, nurseries can increase the number of marketing channels they use and expand their use within individual market channels. For instance, suppose ABC Nursery sells only to garden centers and landscapers. By increasing the types of plants grown and the number of plants grown, ABC Nursery can open a new marketing channel, becoming a supplier to a mass-merchandiser. In addition, ABC nursery can expand its existing markets because it can now attract large landscapers.

Louisiana nursery producers face an important decision when deciding the proper mix of sales through the available marketing channels. Unfortunately, there is very little public information that can assist nursery growers in making this decision. Much of the existing research of nursery markets has been out-dated by the recent rapid growth of the nursery industry. Nursery producers' major sources of marketing information are trade shows, trade journals, other growers and the market itself. As one of the most important crops in Louisiana and the Southeast, a comprehensive study of producer marketing channel choice is necessary.

Problem Justification

It is expected that wholesale production nurseries' marketing channel choices over the past ten years have changed as changes have occurred at the retail level. But is this really the case? Are the marketing channels that nurseries use really changing?

Changes in types of retailers have provided benefits for consumers. Consumers enjoy lower prices, wider selection of plants, and more focus by producers and retailers on providing products the consumer wants. However, as competition forces small garden-centers and other retail outlets out of business, the consumer's choices may be reduced. Also, as larger stores gain more market share, the quality of the nursery products sold may be lower.

Nursery producers are affected by changes in the types and sizes of retailers. It is arguable that the changes to the nursery retailing market are damaged to Louisiana nursery producers, who are mostly small nursery producers with a few intermediate-sized farms. Large retailers usually seek large growers who are more capable of meeting their supply needs. Some retailers and producers appear to be entering into long term partnerships. Because of the relatively smaller size of Louisiana producers, they may have market access problems, particularly in the fast growing mass-merchandise market. Landscapers, garden centers, mass-merchandisers and re-wholesalers are the dominant channels. Only small product quantities flow through 'other' retailers, such as hardware stores.

Landscaping is a service designed to make businesses and homes more attractive. Landscape firms may perform installation and/or maintenance. Landscaping is composed of materials, such as nursery plants, soil and mulch, and labor and skills such as landscape design services. To achieve a more appealing appearance at installation, high quality, mature nursery plants are used. Because landscaping consumers pay for a service and not individual plants, they are not as price sensitive to the cost of the individual nursery products used to landscape their business or residence. Since net margins tend to be higher, the landscape marketing channel is an attractive outlet for nursery producers. However, growth in this segment is constrained by economic conditions that affect disposable income and cost.

Garden centers are retail stores that specialize in lawn and garden products. Garden centers usually offer consumers high quality plants and a knowledgeable sales staff capable of answering questions about lawn and garden issues. Also, they often carry new, trendy and exotic plants. As a result, garden centers charge higher prices than most other nursery retail outlets. Garden centers typically do the majority of their business in plant sales (Garber and Bondari, 1998). Consumers typically use garden centers for purchasing larger shrubs, trees and more unusual plants (Day, 1994). Consumers shopping at garden centers have specific needs and desires, so their demand curve for nursery goods and services tends to be more inelastic, allowing garden centers to charge higher prices. Because of the high margins, nursery producers view garden centers as an important market channel. But, like sales to landscapers, there is a limited market for the high-quality, high cost products that garden centers sell.

Re-wholesalers offer nursery producers many different marketing approaches. Some re-wholesalers offer plants that are not usually sold in regular retail orders. This provides retail buyers with one-stop shopping for their retail orders. Small to mid-sized nursery producers can use the re-wholesaler market channel to expand their sales. After a small nursery has exhausted the more lucrative landscaper and garden center channels, they can sell their remaining inventory to re-wholesalers. By purchasing the remaining inventories from nurseries, re-wholesalers create

enough inventory to fill orders with larger retailers, such as mass-merchandisers. However, while re-wholesalers can offer smaller nurseries an opportunity to expand, they are very price-sensitive. A new concept in the re-wholesaler marketing channel is the Horticultural Distribution Center (HDC) (Garber and Bondari, 1999). HDCs keep a large supply of plants on hand and sell these products to landscape installation and maintenance firms, garden centers, mass-merchandisers/home centers, golf courses and government entities. HDCs offer customers a large inventory of plants to satisfy their needs.

‘Other’ retail outlets include groceries and hardware stores. These retail outlets do not specialize in lawn and garden products and usually carry nursery products as seasonal items. Consumers usually go into these retail outlets looking for non-nursery products, relying on impulse purchases from consumer. ‘Other’ retail outlets usually do not have a sales staff that can help consumers with questions about lawn and garden issues. These retail outlets sell a more standard quality plant. As a portion of total retail sales, ‘other’ retail outlets are losing market share and are a declining marketing channel for nursery producers.

Mass-merchandisers represent the fastest growing market channel for nursery producers. Mass-merchandisers offer consumers both convenience and lower prices. By using complex information systems, mass-merchandisers are able to minimize their inventory while still providing consumers with the products that they desire.

The mass-merchandiser marketing channel can be divided into two segments, general mass-merchandisers and home centers. General mass-merchandisers, such as Wal-mart, K-mart and Target, offer consumers one-stop shopping. Consumers at these stores can purchase a wide range of products including clothing, groceries, auto-care and lawn and garden products. General mass-merchandisers carry mostly standard quality nursery plants and the sales staff at general mass-merchandisers usually does not have extensive nursery knowledge. Consumers use mass-merchandisers primarily to purchase lower cost plants such as bedding plants. Home centers offer a large assortment of home improvement products to consumers. Because of their large size, home centers can offer a product assortment catering to all types of consumers. Consumers can find products in home centers that range in price from inexpensive to extravagant. Home centers have large lawn and garden departments. These lawn and garden departments have a wide variety of standard to higher quality nursery plants. Although there is often a relatively knowledgeable sales staff, the size of the stores and the large number of customers can make these salespeople inaccessible.

Because they purchase large amounts of nursery products, mass-merchandisers prefer to purchase nursery products from large nursery producers. Small changes in price can have huge impacts on profits because of the large sales volume, so mass-merchandisers are very price sensitive. While this marketing channel places constraints on nursery producers, the growth and volume of the mass-merchandiser market channel has made it an important growth opportunity for nursery producers.

Given that Louisiana nurseries have these five channels to market products through, several questions arise. What does the current Louisiana nursery industry look like? How have Louisiana nurseries marketing channel use changed over time? What factors impact a nursery’s use of a particular channel?

Objectives

The objective of this research is to document the current status and to evaluate changes in marketing channel usage in the Louisiana nursery industry over the past 10 years. Three specific objectives are:

1. to describe the Louisiana industry in terms of general information, products, sales considerations, product flow, price determination and sales distribution
2. to examine changes in proportions of sales through major market channels over a 10 year period and
3. to use business characteristics to explain marketing channel choices of Louisiana wholesale nursery growers and of growers in other Gulf Coast states.

Literature Review

The S-103 Research Committee has sponsored three Trade Flows and Marketing Practices surveys. These surveys provide primary information from producers and have spawned several articles. The S-103 Research Committee dedicated to providing more information, research and analysis of the rapidly growing environmental horticulture and floriculture agricultural sectors.

Brooker and Turner (1990) used the first Trade Flows and Marketing Practices within the United States Nursery Industry survey to describe the nursery industry. Nursery producers were asked to describe the kind of plants produced, root/media categories, transaction methods used, trade flows of nursery products and origin of inputs, price determination practices, transportation methods used and resources allocated to advertising media. Fifty-two Louisiana nursery growers responded to the survey, representing the state's five largest growers and a sample of certified growers. Louisiana was one of only five states in the survey that sold more than 50% of its wholesale nursery production out-of-state. Of plants sold to landscapers in other states, Texas was the leading landscaper customer for Louisiana's growers, with an average percentage of total sales to landscapers of 31%. Louisiana landscapers had the second highest proportion at 21%. Sales to re-wholesalers showed shipments went to a total of 15 states, led by Texas with 32% of total sales and with Louisiana re-wholesalers at 23%. Nursery products were sold to retail customers in 11 states, with Louisiana retailers receiving 41% of shipments while Texas was second at 22%.

A second Trade Flows and Marketing Practices within the United States Nursery Industry survey was conducted in 1993 (Brooker, Turner, and Hinson 1995). This survey was essentially unchanged from the 1988 survey to provide a comparable cross sectional data set of the nursery industry. Of the 276 licensed Louisiana nurseries who met the survey's criteria, 72 responded. Well over 90% of Louisiana nursery sales were strictly wholesale sales. Fifty-five percent of Louisiana nursery producers' sales to mass-merchandisers were to in-state retailers. Louisiana garden centers received 73% of the state's production that was sold to garden centers. Louisiana nursery producers sold 57% of their 'other' retail stores sales to Louisiana firms. Within state sales accounted for 55% of Louisiana nursery production sold to landscapers. Texas held the largest proportion of Louisiana nursery production sold to re-wholesalers at 46%. Louisiana re-wholesalers only received 16% of nursery production sold through the re-wholesaler marketing channel.

Klein (1996) used the California portion of the 1988 and 1993 TFMP survey to describe and summarize the California nursery industry. Nurseries were categorized as small (sales of less than \$99,999), medium (sales between \$100,000 and \$999,999) or large (sales of greater than \$1,000,000). In 1988, small nurseries did 46.9% of their sales with retail firms, 30.9% of sales with landscape firms and 22.1% of their sales with re-wholesale firms. Medium sized nurseries had 41.9% of their sales with retail firms, 34.5% of their sales with landscapers and 23.6% of their sales with re-wholesalers. Large California nurseries had 39.4% of their sales to retail firms, 34.6% of sales to landscapers and 26% of sales to re-wholesalers in 1988. All California nurseries in 1988 had 42.6% of sales to retail firms, 33.4% of sales to landscapers and 24% of sales to re-wholesalers. Aggregating the estimates of sales to garden centers, mass merchandisers and other retailers, generated an estimate of the 1993 percentage of retail sales. Small nurseries' total sales were distributed among retail firms (15%), landscape firms (35.6%) and re-wholesalers (49.4%). Medium nurseries had 38.2% of total sales to retailers, 43.3% of sales to landscapers and 18.5% of sales to re-wholesalers. Large California nurseries had 54.1% of their total sales to retailers, 23.8% of sales to landscaper firms and 22.1% of sales to re-wholesalers. Large nurseries had 29% of their total sales to mass merchandisers, while both small and medium nurseries had sales of less than 2%. California nurseries had 25% of sales to garden centers, 12% of sales to mass merchandisers, 4% to other retailers, 34% of sales to landscapers and 25% of sales to re-wholesalers in 1993. The dramatic change in small nurseries' proportion of sales to retailers was thought to be caused by the recession in the early nineties. The increase in use of the re-wholesaler marketing channel by small nurseries was thought to be a result of re-wholesaler's becoming large enough to become a supplier to mass-merchandisers. Large nurseries had a higher proportion of sales to mass-merchandisers because they are able to offer large amounts of product at low prices. Large nurseries were also the most diversified of the three groups, with their proportion of sales more evenly divided between garden centers, mass merchandisers, landscapers and re-wholesalers.

Hodges (1992) used the Florida portion of the 1988 TFMP survey to examine the structure and market organization of Florida's landscape plant industry. The study used 125 responses from Florida nursery producers. Hodges found that 55% of Florida nursery plant sales were in evergreen plants. Container grown production was the dominant production method, comprising 82% of all sales. Florida, the second largest state in nursery production, sold over 71% of its production in-state. Landscapers were the largest marketing channel in Florida, with 40% of total sales, followed by re-wholesalers with 33% and retailers with 27%.

Knowledge of nursery consumers' tastes and preferences is important in making production decisions. Several articles examined the preferences of both retailers and consumers of nursery plants. Foltz et al. (1993), described production nurseries' methods of satisfying customers wants and needs through the use of market segmentation. Survey data were collected from 311 garden centers, landscapers and combination garden centers/landscaping firms. Organizing customers by their different needs, characteristics and behaviors, should allow nurseries to develop better strategies for focusing on specific target groups. The study focused on the characteristics, needs and behaviors of garden centers and landscapers. The results found that product and service attributes of production nurseries were grouped into 3 categories: buyer-oriented services, buyer perception of supplier reputation and sales support. The paper found that buyer-oriented services were ranked as the most important, although the most important attribute was plant quality, a 'buyer perception of supplier reputation' category. The high rank

of plant quality reinforces the belief that garden centers and landscapers place a high value on plant quality.

The National Gardening Association's 1998-1999 National Gardening Survey described consumer gardening practices, trends and product sales. Descriptions were presented in tables and simple linear regression was used to estimate trends. The survey tracked many aspects of the lawn and garden industry including sales distribution of retail outlets, sales distribution by regions and average household spending on lawn care products by region. The South, including Virginia, North Carolina, Florida, Tennessee, Arkansas, Oklahoma, Texas, Kentucky, South Carolina, Georgia, Alabama, Louisiana and Mississippi, accounted for about 30% of total lawn and garden retail sales in 1998, and these consumers of lawn and garden products spent an average of \$445 per household. The survey examined the proportion of nursery sales to households through the available marketing channels from 1993 to 1998. Landscapers sold products to 9 million households in 1998, up from recent years, but still down from a high of 12.5 homes in 1993. Garden centers were the most popular outlet for nursery products during this period, with about 48% of households purchasing nursery products from 1993 to 1998. 'Other' retail outlets experienced a downward trend, moving from a high of 29% of households purchasing nursery products in 1993 to a low of 24% of households in 1995. Mass-merchandisers' lawn and garden product sales were relatively stable, with about 32% of households purchasing products over the period. Home Centers experienced the most growth of all the lawn and garden retailers. In 1993, Home Centers sold lawn and garden products to about 29% of all households. By 1998, Home Centers were selling nursery products to 43% of households.

The studies and reports on the Trade Flows and Marketing Practices Within the United States Nursery Industry, the National Gardening survey and the ERS Briefing room present both a basic understanding of the nursery industry and examples of previous nursery industry descriptions. In particular, the previous Trade Flows and Marketing Practices Within the United States Nursery Industry descriptions provides a framework to work with and build upon.

Other studies have attempted to explain various relationships within the nursery industry using causal models. Hinson and Turner (1994) examined producers' choices among marketing channels in the landscape plant industry. Data used in the analysis was from the 1989 Trade Flows and Marketing Survey of the United States. The study found that firm age averaged 21 years with sales of \$876,000. Competition was seen as the most limiting factor in expansion by 36% of responding growers. Additionally, 38% of wholesale nurseries sales went to landscapers, while retailers and re-wholesalers received 28% and 24% of sales, respectively. The article hypothesized that market channel choice was influenced by the firm's age, size, propensity to negotiate, diversification strategies, organizational structure, competitive pressures and the location of the nursery. A tobit model with standard t-tests was used to evaluate these relationships. Larger, more established nurseries were expected to sell to retailers rather than to engage in direct retail sales. Producers in the West and Southeast have the advantage of a longer growing season, which could influence choices in marketing channels. The article found that wholesale nursery producers with a higher percentage of sales to retailers were located in the northeast, southeast and west, relative to the base regions of the Midwest and Upper South. Nurseries in the southeast and west were found to have a lower percentage of sales to landscapers. Southeastern and western states had a higher proportion of sales to re-wholesalers. The age of the firm and whether the firm was incorporated were not significant in explaining the

market channel choice. The propensity to negotiate price, number of transactions methods used and regional location of the nursery were found to be very important in determining the percentage of sales through the various marketing channels.

Hinson, et al. (1995) examined whether selected business characteristics affected wholesale nursery transaction methods. The article used data from the 1989 Trade Flows and Marketing Survey of the United States. The transaction methods available to nursery plant producers were negotiated sales, sales at trade shows, telephone sales, in-person sales, and mail order sales. Business characteristics used to evaluate choice of transaction methods were age of the firm, 1988 gross sales, percentage of sales to the final customer, percentage of wholesale sales to retailers, percentage of wholesale sales to landscapers, percentage of wholesale sales to re-wholesalers, whether the firm was incorporated, whether the firm identified competition as the most limiting factor in expansion and regional location. Larger nurseries were expected to sell through both the in-person and trade show methods more frequently. Large nurseries usually dealt with large buyers and the transactions were a significant investment, often requiring in-person involvement between buyers and sellers. Larger nurseries can also absorb the cost of attending a trade show more easily. Smaller, more specialized nurseries were expected use telephone and mail order sales more, as these transaction methods are less costly. A Tobit model was used to estimate the relationships between transaction methods and the business characteristics of wholesale nurseries. The model found that identification of competition as the most limiting factor of growth and regional location of the nursery were not significant in explaining the type of transaction method used. Gross sales, percentage of sales to retailers, percentage of sales to re-wholesalers, percentage of sales to landscapers and whether the nursery was incorporated were influential in explaining the type of transaction method used by nurseries.

Chapter 2

Theoretical Considerations

Preference Theory

Preference theory provides a background for explaining consumption decisions (Morgan, 1980). It is assumed that consumers are rational. That is, a consumer's behavior will be in agreement with a rational set of preferences. However, consumer preference is dynamic. Changes in consumer preference can come about from advertising, choices made by other consumers and/or prices.

Four assumptions are made in evaluating consumer behavior. The first assumption is that consumer's desires are complete. Given any two bundles of goods, a consumer can tell if he or she prefers one bundle to another or is indifferent between the bundles. The second assumption is that consumer's preferences are transitive. If a consumer prefers bundle A to bundle B and prefers bundle B to bundle C, then he or she prefers bundle A to bundle C. Non-satiation is the third assumption. Consumers are never satisfied with what they have and will always prefer a bundle of goods that has more of one commodity. Finally, a consumer's tastes and preferences are subject to a diminishing marginal rate of substitution. The marginal rate of substitution reflects a consumer's willingness to pay for an additional unit of commodity A in terms of consuming less of commodity B. As consumers move along their indifference curve, the marginal rate of substitution of one good for another falls. Given a preference curve for a bundle of goods containing commodities A and B, as a consumer obtains more of commodity A, he or she will be more willing to sacrifice commodity A to obtain additional units of commodity B.

There are three steps that must be considered when evaluating a consumer's behavior. First, what does the consumer want? There must be information about a consumer's preferences

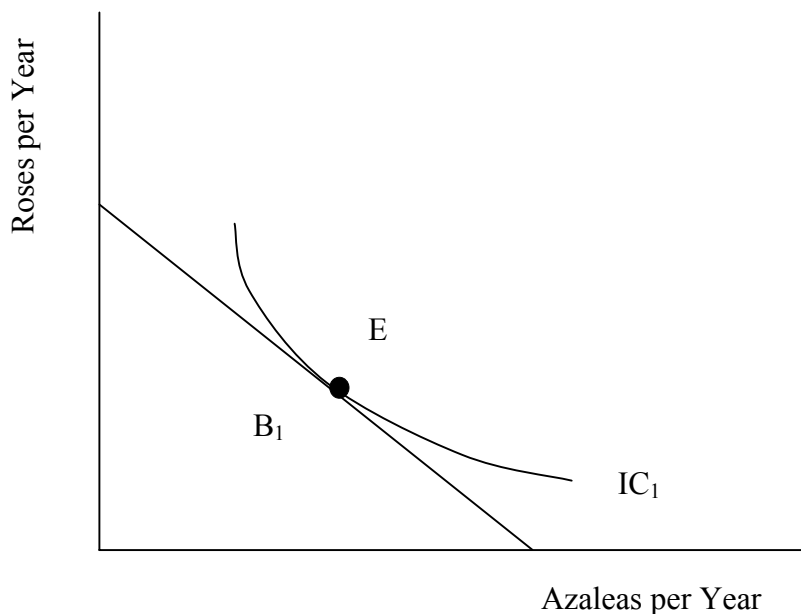


Figure 2.1 – Consumer Indifference Curves and Budget Constraints for Roses and Azaleas

for a given set of products. This information creates an indifference curve that, for any two commodities, shows the mix that a consumer is indifferent between. IC_1 in Figure 2.1 shows consumer A's indifference curve for nursery products and all other products. Next, what can the consumer do? All consumers face constraints, such as income or time. Budget B_1 in Figure 2.1 shows consumer A's budget constraint for nursery products and all other products. Finally, a consumer's preferences must be matched with his or her constraints to determine what consumption decisions a consumer will make. Point E in Figure 2.1 shows where indifference curve IC_1 is tangent to budget constraint B_1 . At point E, consumer A is maximizing her well being relative to her budget constraint. She is consuming at the highest indifference curve that her budget constraint will allow.

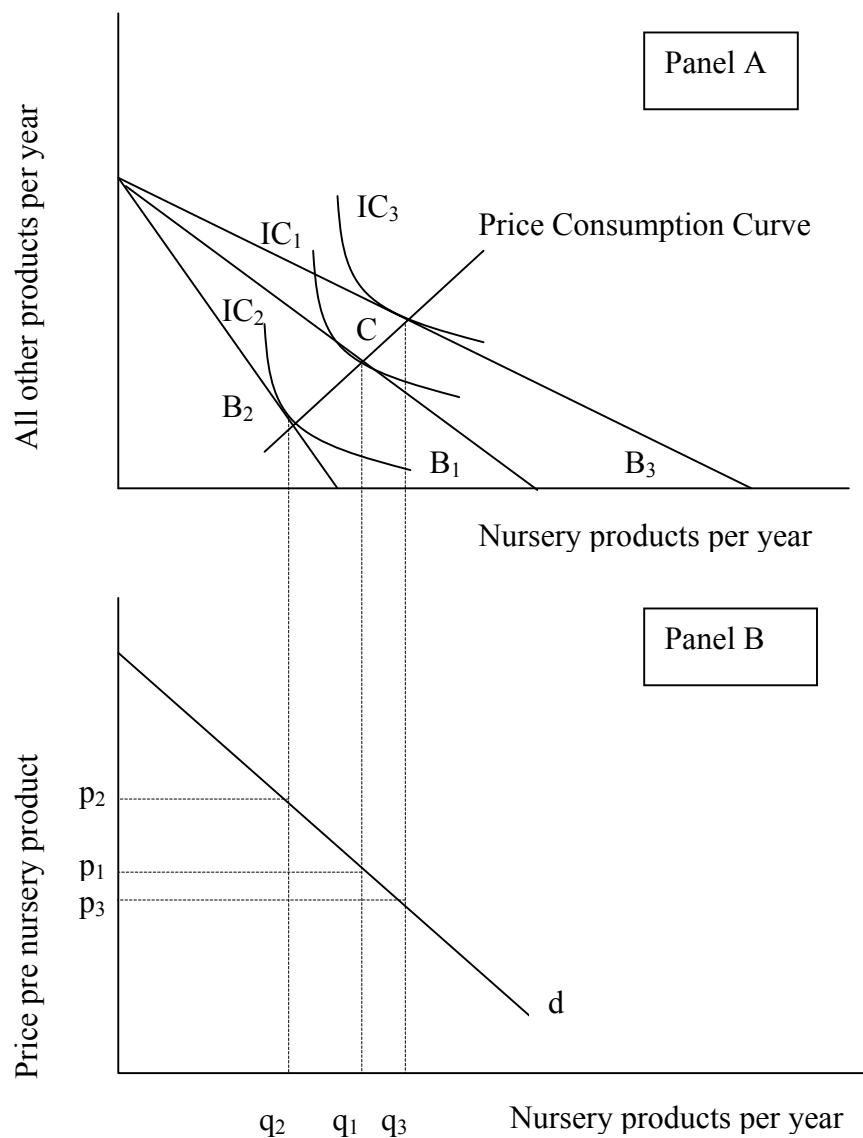


Figure 2.2 – Derived Demand for Nursery Products

As the price of nursery products changes, *ceteris paribus*, the set of commodity bundles reveals the price consumption curve. Panel A of Figure 2.2 shows consumer A's price consumption curve. Raising or lowering the price of nursery goods, *ceteris paribus*, allows consumer A to purchase smaller or larger quantities of nursery goods. Observing consumer A's preference for nursery goods at different prices allows her demand for nursery products to be derived. Panel B of Figure 2.2 plots nursery products per year on the horizontal axis and the price of nursery products on the vertical axis. Price p_1 , p_2 and p_3 correspond to the price of nursery goods for budget lines B_1 , B_2 and B_3 , respectively. Plotting consumer A's quantities at these prices reveals her demand curve for nursery products. Aggregating the demand for nursery goods of all consumers reveals the total demand for nursery products.

Production Decisions

Nursery producers face similar issues when making production decisions (Kirzner, 1963). Constraints confronting a nursery producer include land, labor, cash and managerial experience. The combination of these and other constraints provides a nursery with a production possibilities frontier (PPF). Figure 2.3 shows an example of a PPF faced by ABC Nursery, a nursery that can produce either roses or azaleas. Given that ABC Nursery has limited resources, it can produce anywhere on or inside line PP. The PPF shows the marginal rate of transformation for ABC Nursery, the cost that the nursery can transform roses into azaleas. The marginal rate of transformation is reflected in the negative slope of PP. While ABC Nursery can produce anywhere inside or along

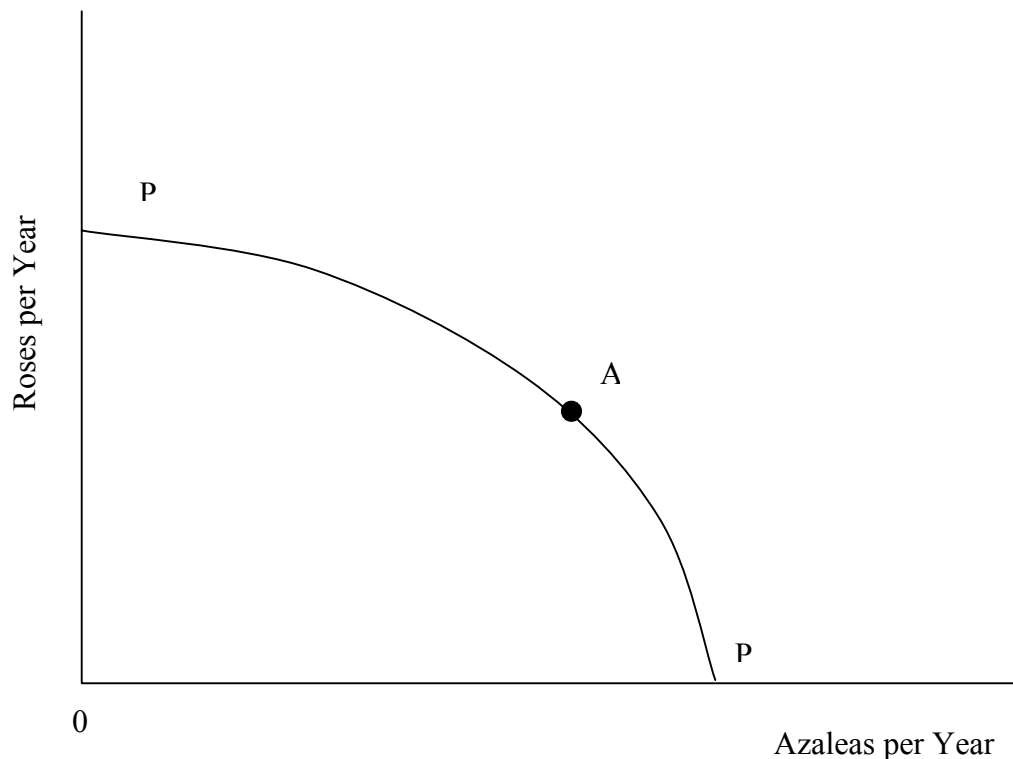


Figure 2.3 – Production Possibilities Frontier

PP, the points along PP represent the most efficient production options for the nursery. To produce at a point inside PP would mean that ABC Nursery was not maximizing its resources of production.

Producers must continually keep an eye on consumer purchasing trends. While producing at point A may be efficient, it may not be a product mix that the market desires. Consumers may decide that they no longer like roses, causing ABC Nursery to have to change its product mix to azaleas and dogwood trees. Changes in product mix can cause inefficiencies while producers learn the best combination of inputs to produce a particular plant.

Competitive Model

Analysis of most agricultural markets, including that of nursery plants, often uses the model of perfect competition (Green, 1978). Buyers and sellers in the nursery market are assumed to be price takers. There are a large number of both buyers and sellers. Sellers in a perfectly competitive market do not behave strategically. New suppliers should have free entry into a perfectly competitive market. One supplier's plants are identical to another supplier's plants. Finally, buyers in a perfectly competitive market should have complete knowledge of the price and the quality of the nursery plant. Based on this model and these assumptions, the link between consumption and production has been derived.

Output Efficiency

In order for the nursery market to be efficient, it must both produce plants at the minimum cost and produce plants in combinations that match consumer's willingness to pay for them (Kirzner, 1963). The marginal rate of substitution (MRS) reflects a consumer's willingness to pay for another unit of azaleas in terms of consuming fewer roses. The marginal rate of transformation (MRT) shows the cost of producing an additional azalea in terms of producing fewer roses. For a market to produce efficiently, it must produce where the marginal rate of substitution equals the marginal rate of transformation, for each consumer.

$$\text{MRS} = \text{MRT} \quad (1)$$

All consumers in a perfectly competitive market allocate their budgets so that their marginal rates of substitution between two goods are equal to the price ratio,

$$\text{MRS} = P_R / P_A \quad (2)$$

where P_R = price of roses and P_A = price of azaleas

Producers in a perfectly competitive market are expected to be profit maximizing. Profit maximizing firms will produce output until the price of the output equals the marginal cost of production.

$$P_R = MC_R \quad \text{and} \quad P_A = MC_A \quad (3)$$

where MC_R = marginal cost of roses and MC_A = marginal cost of azaleas

As stated above, the marginal rate of substitution is equal to the marginal rate of transformation, so it follows that,

$$\text{MRT} = MC_R / MC_A = P_R / P_A = \text{MRS} \quad (4)$$

Figure 2.4 shows Nursery ABC's PPF relative to consumer A's indifference curve for roses and azaleas. Point E is the point on both consumer A's indifference curve and ABC Nursery's PPF that maximizes consumer A's satisfaction. Nursery ABC can produce anywhere

on the PPF and be technically efficient, but point E is the only point that coincides with the most efficient production point for consumer A. The marginal rate of substitution and the marginal rate of transformation are equal at point E.

While the perfectly competitive model shows an optimal solution, the assumptions of the model are seldom met in existing markets. On the consumption side, the retailing sector has changed from many small garden centers, hardware stores, and other outlets to a system of retailing where mass merchandisers are gaining market share rapidly. This and other changes suggest that retailers may be able to exert market power over producers. The theory of imperfect competition may more appropriately describe the nursery industry market structure.

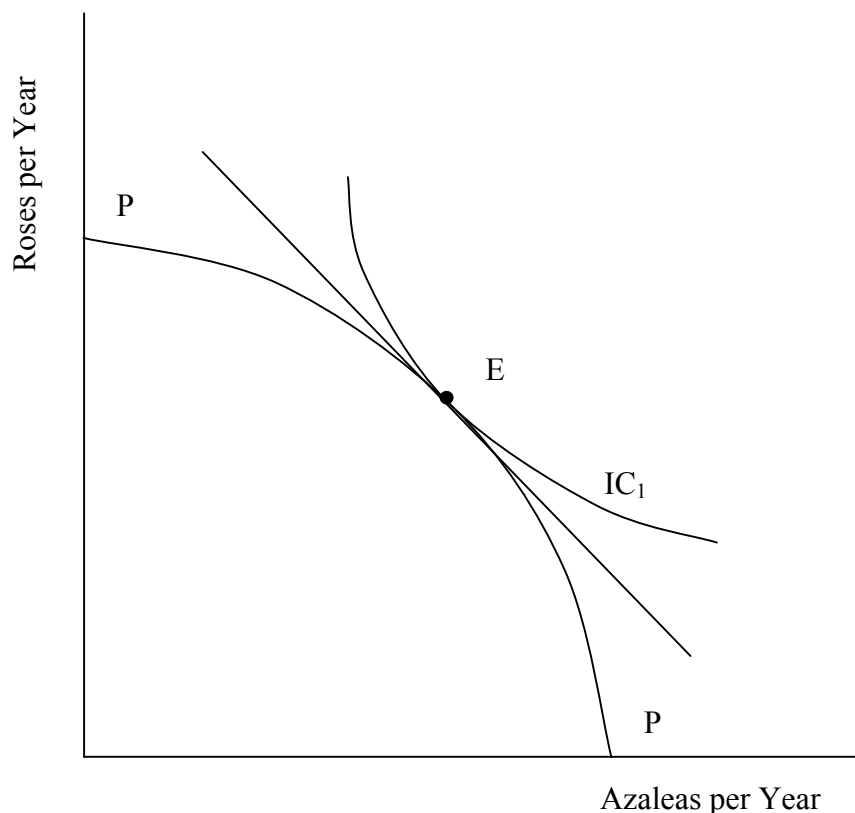


Figure 2.4 – Output Efficiency

Market Structure

The theory of efficiency-of-exchange states that middlemen exist because they facilitate more efficient exchanges than direct producer to consumer contact (Hartly, 1983). Figure 2.5 illustrates the efficiency-of-exchange theory. If three producers were to each market their own products to three consumers, there would be 9 contacts. If those same three producers used a middleman to market their products to the three consumers, the number of contacts is reduced to 6.

Middlemen create a more efficient market by specializing in marketing functions while nursery producers can specialize in plant production. Each middleman in the nursery plant

industry has developed marketing techniques to meet specific customer needs. Nursery growers can concentrate most of their available resources on plant production. However, when expanding into new market channels, nursery producers must increase their marketing expense to cultivate new relationships with the middlemen in these new marketing channels.

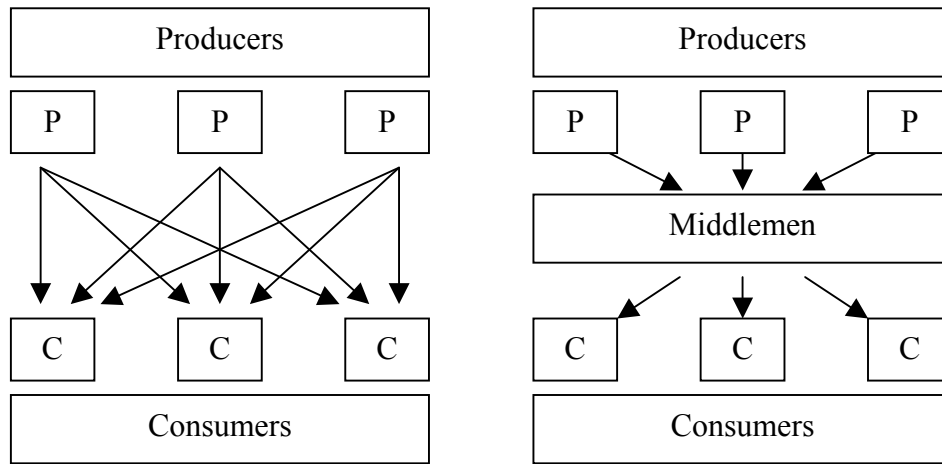


Figure 2.5 - The Theory of Efficiency-of-Exchange

Imperfect Information

While the market is assumed to be perfectly competitive, it may more often resemble a monopsony. Large retailers, such as Walmart and Home Depot, command tremendous market power and can dictate prices to producers, reducing the market's efficiency. As mass merchandisers gain market power, they are able to increase their returns.

The market should send clear signals, but the flow of information between consumers and producers can often be inaccurate. The distance between consumer and producer varies from marketing channel to marketing channel in the nursery industry. As this distance between consumers and producers grows, some information is lost.

Producer Response

Given these considerations, nursery producers must choose the combination of plants to produce and develop a marketing strategy to achieve the desired output. The marketing channel or channels and their characteristics are one factor a producer must consider as a component of overall strategy. A producer may be comfortable supplying only landscapers with plants or may want to expand the business and diversify by selling through multiple channels. An important decision in whether to use a particular marketing channel is that channel's sales potential. If a channel will take time to develop and turn a profit, some nurseries might not have the time or money to risk. Another concern in choosing a marketing channel is the degree of bargaining power that a nursery producer will have within that channel. Small nursery producers will have very little negotiating power when dealing with large retail chains. Finally, some producers may be predisposed to deal with some marketing channels and not to deal with others for a variety of reasons, perhaps because a particular channel does not position their products correctly.

In summary, it is recognized that many factors affect consumer preference and in turn influence nursery growers' production and marketing decisions. In addition, the organizational structure and characteristics of individual farms influence these decisions. Holding consumption and production considerations constant, this research posits a causal relationship between a set of characteristics of wholesale production nurseries and the proportions of their output sold to the alternative marketing channels.

Chapter 3

Methodology

In 1998, Louisiana participated in the third Trade Flows and Marketing Practices within the United States survey (TFMP). This mail response survey collected producer level information on production, sales and marketing variables that described various aspects of the Louisiana nursery industry. The 1998 survey, the third in a series, was essentially unchanged from the initial 1988 study.

The two previous nursery TFMP surveys were conducted in 1988 and 1993. Twenty-two states participated in the 1998 survey. The 1988 and 1993 surveys had participation from 23 and 24 states, respectively. The three surveys differed slightly because the 1988 and 1993 surveys only collected data on environmental horticulture, while the 1998 survey collected information on both environmental horticulture and floriculture. The surveys also differed slightly in the variables collected. Some variables, such as retail sales, have been broken out into their components. Other variables, such as levels of computerization, have been included as new technologies have become more prevalent in the industry. The combination of these results provided a substantial body of data. A copy of the 1998 TFMP is provided in Appendix A.

The Louisiana Department of Agriculture and Forestry (LDAF) provided a list identifying all nurseries that have a class one license, which Louisiana requires for a nursery to sell plants. To qualify, a nursery grower must have either 200 square feet of greenhouse production area or 2,500 square feet of nursery farm production area. A total of 734 nurseries were on the list provided by LDAF.

Many retail and hobby nurseries have obtained a class one license, so it was necessary to limit the nurseries included in the TFMP to only the target population, wholesale nurseries. All nurseries that met the class one license requirements for greenhouse square footage and those nurseries that had farm production area greater than or equal to 0.5 acres were included in the questionnaire's first mail-out. All the greenhouse nurseries were included because of their intensity of production. Even a small greenhouse can generate significant sales. Nursery farm acreage production was limited to 0.5 acres and above in an effort to exclude small 'hobby' nurseries. A question in the TFMP survey asked whether or not a nursery is wholesale or retail. Five hundred and seventy nursery growers met the above requirements. Each was assigned a number to track whether the producer responded to the mail survey.

The Dillman protocol was used in the mailing procedure to increase the response rate. This protocol consists of an initial mailing followed by a post card sent to all nursery growers who had not responded within three weeks of the initial mailing. Two weeks after the postcard was sent, a second survey was mailed to all the nurseries that failed to respond.

Many of the initial survey responses were from small retail nurseries, not wholesale production nurseries. Also, many of the responses from these small retail producers were incomplete and unusable. Because the target population was the commercial wholesale nursery industry, the acreage requirement was raised to 0.75 acres to remove small nurseries with limited production. This reduced the number of nurseries in the survey from 570 to 548. Other survey respondents indicated that they were either purely retail, no longer in business or did not wish to participate in the survey, which reduced the number of eligible nurseries in the survey to 501. From the mail survey, 171 useable responses were received. Responses from all participating states were sent to the University of Tennessee, where they were coded and compiled.

Discussions with the Louisiana Agricultural Statistics Service (LASS) produced the opportunity to collect data from the non-responses to the mail survey. LASS collected nursery industry information in its Census of Horticultural Specialties (CHS), a national assessment of the production and sales variables affecting nurseries (NASS, 1999). The data collection effort for the 1998 Louisiana CHS was conducted during the same time period as the TFMP. The CHS was drawn from the same general population as the TFMP, though the CHS excluded all nurseries with sales of less than \$10,000. The horticultural census provides an in-depth description of each of Louisiana's nurseries from a production point-of-view, including estimates of total dollar sales, total sales of each type of plant (both floriculture and environmental horticulture), and number of each type of plant sold.

A cooperative agreement was reached with LASS to survey the non-respondents to the TFMP mail survey. LASS maintains a staff of telephone enumerators both to administer LASS surveys and to get data from non-respondents to LASS surveys. These telephone enumerators were used to collect data from the 333 non-respondents of the TFMP survey. The data collection staff was familiar with working with nursery producers because they had recently worked with the CHS. To keep the telephone interviews as short as possible, enumerators asked only for information that was unique to the TFMP survey and could not be provided by the Census of Horticultural Specialties.

Complete responses were obtained from 123 growers. The remaining growers either declined to provide the information, reported that they were no longer in business or were small nurseries with mostly retail sales. For these 123 respondents, data from the CHS database and data from the telephone survey were merged to form a complete observation, and were sent the University of Tennessee for coding and compiling. The resulting data set comprised of both the mailing and telephone surveys had a total of 294 usable responses.

The TFMP survey, both in its current and previous forms, was designed to capture at least 75% of a participating state's sales. The 1998 Louisiana TFMP data collection effort attempted to capture all of Louisiana's wholesale nursery sales by collecting data through the mail and over the telephone. By obtaining a larger number of responses, the 1998 TFMP data set should be more representative of Louisiana wholesale production nurseries and, thus, should provide a better basis for providing descriptive statistics and building empirical models.

Procedures

Objective 1 – To describe the Louisiana industry in terms of general information, products, sales considerations, product flow, price determination and sales distribution.

Data from the third TFMP survey will be used to describe the Louisiana nursery industry. The description of distribution of products, market channels and other variables by sales categories will be in tabular form, similar to the previous descriptions developed for the 1988 and 1993 TFMP surveys.

It was expected that large and small nurseries have different characteristics. Nurseries were divided into a large and a small group based on total sales. Based on the available sales categories, intuition and sample size, \$200,000 in sales was used as the dividing line between large and small nurseries.

Objective 2 – To examine changes in proportions of products sold through major market channels over a 10 year period.

Comparisons of the changes in proportions of sales through the various marketing channels can suggest changes in nursery producers' marketing strategies over time. Comparing the three TFMP surveys will show if nursery producers have changed their use of marketing channels. Data from the 1988 TFMP survey only contained information on the landscaper, re-wholesaler and retail marketing channels. The 1993 and 1998 TFMP survey provided information for the landscaper and re-wholesaler channels with the retail category broken down into garden centers, mass merchandisers and other retailers.

The variables used to compare the three data sets were the proportion of sales through each marketing channel, total sales and the year of the observation. The data had to be modified to compare the 1988, 1993 and 1998 data sets. The three retail marketing channels from the 1993 and 1998 TFMP survey were condensed into a single 'retailer' category. Finally, a variable was added to the data set to identify which of the three marketing channels was represented by a given observation.

Total sales were adjusted for inflation using the producer price index for farm products with a base year of 1982. The use of real prices allowed the three data sets to be compared without fear of inflation or deflation. The data were then divided into three different sets, one for each marketing channel. For comparison and benchmarking, a Gulf States model using TFMP data from Georgia and Alabama (states with production characteristics similar to Louisiana's and states that participated in all three TFMP surveys) was created and analyzed in the same manner as the Louisiana model.

The ANOVA procedure in the SAS software package was used to test for differences in the proportion of the three marketing channels between the 1988 and 1993 and the 1993 and 1998 intervals. The 1988 and 1998 data also were compared to indicate any changes to the nursery marketing decisions over the past decade. This testing procedure evaluated differences in the mean between interval years. If the means and variances were significantly different from each other between the two periods, then it can be concluded that nursery growers' markets and/or marketing decisions had changed between the two periods. Each marketing channel requires three different models, one for the 1988 to 1993 interval, one for the 1993 to 1998 interval, and one for the 1988 to 1998. The dependent variable was the proportion marketed through each channel while the independent variable was the year of the observation.

Large and small nurseries should exhibit different marketing strategies over the time intervals. Total sales were again used to segregate large and small nurseries, with \$200,000 as the dividing line. Separating the data by sales resulted in a total of 12 models for each state/region. It was expected that small nursery market channels would remain relatively stable, maintaining a high proportion of sales to landscapers and re-wholesalers throughout the intervals. Large nursery market channels were expected to change, with an increase in the proportion of sales to retailers.

Objective 3 – Use business characteristics to explain marketing channel choices of Louisiana wholesale nursery growers and of growers in other Gulf Coast states.

A sub-set of market-oriented variables was analyzed to determine what factors contribute to Louisiana and Gulf States nursery growers' marketing strategies. This was done by analyzing which marketing and production characteristics were significant in estimating the proportion of sales through each of the five marketing channels.

Garden centers have traditionally been the retail outlet where consumers purchased nursery products. These specialized stores continue to be important players in the nursery market, but their market share has declined. They typically offer consumers a wide variety of plants and other goods, including rare and unique products, and knowledgeable, interested staff and management. They know their customers' needs, having built relationships over time. Garden center customers tend to be more concerned with product quality than with product price. As a result, growers of all sizes are interested in building and maintaining relationships with garden centers.

Landscapers are another preferred nursery customer. Landscapers perform exterior and interior installation and/or maintenance. This channel provides value-adding services to the grower's product. A landscaping project initially is judged by its appearance and then by whether the plant material lives and thrives. Landscapers are interested in installing quality plants, so they maintain relationships with growers who consistently provide plants with those characteristics. For these reasons, nursery sales into this channel find a less price-sensitive customer.

The mass-merchandisers channel is gaining market share. This channel has focused on standard plant varieties, quality and large seasonal inventories. Mass-merchandisers use a low price, high volume retail strategy. Regional-level buyers are responsible for purchasing plant material and scheduling delivery to stores. These buyers typically are interested in contractual relationships with large growers, a strategy that reduces the number of suppliers they must deal with. Price is a major concern for both mass merchandisers and their customers. Sales to mass merchandisers usually result in a lower per unit price to growers, but many feel they must serve mass merchandisers because of their increasing market share.

Re-wholesalers play a varied role in the market. Some are wholesale production nurseries that purchase and resell material from other nurseries as a strategy of providing better customer service through a broader assortment and larger quantities. Other re-wholesalers are not producers, but buyers and sellers. These firms often are located near large metropolitan markets where they function as both basic provider and backup inventory supplier of a wide range of plant varieties and qualities. From this position they serve a broad range of the market, from landscapers to retailers of various descriptions. To be competitive, re-wholesalers are price-sensitive in their purchasing activities, so they are not as attractive to growers as garden centers or landscapers.

'Other' retailers is a catch-all category of stores that typically sell nursery plants as seasonal products. The category includes chains of smaller hardware stores. Some sell high-quality plant material, while others provide standard quality plants. In this category, one would expect to find a large amount of variation in marketing strategies, making generalizations about this marketing channel difficult to establish.

Of these five marketing channels, landscapers and garden centers are considered the core marketing channels. These channels offer both large and small nurseries a steady and stable stream of income. Re-wholesalers and mass merchandisers are considered the growth marketing channels. These channels offer growth opportunities to nurseries that can meet the more stringent requirements of these customers. As a catchall channel, 'other' retailers are expected to offer a mixed bag of opportunities to nurseries. However, the 'other' retailer channel is expected to have a relatively small proportion of total sales and is not expected to offer significant growth opportunities.

Wholesale nurseries vary in the approach they take to selling, with nursery size being an important factor. Small volume growers cannot afford extensive selling activities. They tend to

rely on printed information, local and regional trade shows, walk-in customers at the nursery site, and telephone sales. Small nurseries are expected to concentrate most of their marketing activities in the core marketing channels.

Larger nurseries use different approaches to selling. They may attend more and/or larger trade shows. Printed material used by larger nurseries is typically higher quality. Larger nurseries may use more and better-trained telephone salespeople. Among the largest nurseries, outside salespeople may be employed. Generally, these salespeople serve a defined territory, calling on existing customers and developing new business. These sales organizations are costly and the sales volume they generate must be sufficient to justify this cost. Large nurseries want to and do serve the core marketing channels of garden centers and landscapers. They also diversify into other market channels and customers. Higher advertising expenditures are observed in larger nurseries, and are associated with a more diversified marketing mix. The mass merchandiser and re-wholesaler channels represent growth opportunities for large nurseries, but these channels also typically offer smaller margins than the core channels.

Marketing channel use was hypothesized to be a function of grower and market characteristics. Table 3.1 identifies these variables and provides an explanation of their construction. Table 3.2 shows the expected impact, positive or negative, on the proportion of sales through each channel and for each variable. For several channels, such as small nursery sales to mass-merchandisers and the entire 'other' retailers channel, many of the expected signs of the variables are unknown.

Data for many TFMP variables were collected as a percentage of total sales. While two nurseries may both have the same proportion of sales for a given variable, if one nursery has higher total sales, it should have more of an influence on the dependent variable. Sales-weighting these variables places more emphasis on nurseries with higher sales. To sales-weight these variables, the percentages were multiplied by each observation's total sales. Total sales

Table 3.1 - Model Variable Descriptions

Variable	Description
Acres	Number of acres in container production, obtained directly from the TFMP survey
Advertising expenditure	Total sales times the proportion of sales used for advertising
Age	1999 minus the year established
Channel	5 dummy intercept variables for each of the equations (1 if true, 0 if false)
Computerization	Dummy variable indicating whether a nursery uses 3 or more computer functions (1 if true, 0 if false)
Contract production sales	Total sales times the proportion of sales used for contract sales
In-person Sales	Total sales times the proportion of in-person sales
In-state sales	Total sales times the proportion of in-state sales
Repeat customer sales	Total sales times the proportion of sales to repeat customers
Telephone sales	Total sales times the proportion of telephone sales
Use of four or more channels	Dummy variable indicating whether a nursery sells to four or more marketing channels (1 if true, 0 if false)

were reported as in one of 11 sales ranges. The value used for total sales was the midpoint of the indicated sales range. The advertising expenditure, contract sales, in-state sales, in-person sales, telephone sales and sales to repeat customers variables were all sales-weighted. Advertising expenditure is expected to have a positive impact for growth channels of mass-merchandisers and re-wholesalers and a negative impact on the core channels of garden centers and landscapers. Contract sales should have a positive impact on sales to mass-merchandisers, which encourage contract production, and a negative impact on the core channels. In-state sales should be higher for traditionally local channels like garden centers and landscapers and negative for channels that are normally out-of-state like re-wholesalers and mass-merchandisers. In-person sales are associated with acquiring new business and are expected to be positive for the growth channels and negative for the core channels. Telephone sales, however, are believed to be associated with more familiar business relationships and are expected to be positive for the core channels. Sales to repeat customers are expected to have a positive impact on the core channels and a negative impact on the growth channels. As sales to repeat customers decrease, it is expected that a nursery is expanding into new channels at the expense of sales to other channels.

Three sets of dummy variables were included in the model. Each of these sets of variables would take on a value of 1 if it was true and 0 if it was false. The first dummy variable represents the intercept for each of the 5 channels. These variables were not included in Table 3.2, but they should be a positive for each channel. The next dummy variable determined if a nursery had 3 or more marketing and production functions computerized. Nurseries with high levels of computerization should pursue a more diversified marketing strategy, pursuing the growth marketing channels at the expense of the core channels. The final dummy variable tested marketing diversification by determining if a nursery used four or more marketing channels. Nurseries that used more marketing channels should be more diversified, selling less to the core marketing channels and more to the growth channels.

The other variables included in each equation were total acres in container production and age. Total acres in container production was obtained directly from the TFMP data. The age variable was obtained by subtracting the year established from 1999. Larger total acres and

Table 3.2 - Model Variables and Expected Signs for Large and Small Nurseries

Variable	Expected Sign				
	MM	GC	LD	RW	OR
Acres	+	-	-	+	?
Advertising expenditure	+	-	-	+	?
Age	+	-	-	+	?
Computerization	+	-	-	+	?
Contract production sales	+	-	-	?	?
In-person sales	+	-	-	?	?
In-state sales	-	+	+	-	?
Repeat customer sales	-	+	+	+	?
Telephone sales	-	+	+	?	?
Use of four or more channels	+	-	-	+	?

+ (positive), - (negative), ? (unknown); MM (mass merchandisers), GC (garden centers), LD (landscapers), RW (re-wholesalers), OR (other retailers)

higher nursery age are associated with high sales. Older nurseries with large acreage should have a diversified marketing mix, showing positive impacts for the growth channels and negative impacts for the core channels.

Initial modeling attempts included several subjective variables that were thought to impact grower marketing decisions. The TFMP contained variables in the form of statements rated by the respondent on a Likert-style scale, reflecting impact on the business, with 1 being not important and 5 being very important. A dummy variable was created to represent whether growers thought capital acquisition, the ability to hire competent management, product uniqueness, grade of plants and market demand had a value of 4 or greater (see survey instrument in Appendix A for wording of these questions). On the hypothesis that behavior may be reflected in opinion, these variables were included in the model, but none were significant in any formulation. These dummy variables were modified to contrast observations with values of 1 through 4 to those with a value of 5. However, none these variables were significant. As a result, these subjective dummy variables were dropped from the model.

The proportion of sales through each marketing channel is a limited dependent variable. The proportion of sales through a marketing channel must be between 0 and 100. Further, the sum of the proportions through each marketing channel must equal 100.

Preliminary models included a restriction that the sum of the five parameter estimates had to equal 100%. However, analysis of these model results showed that the restricted and unrestricted models were the same. This indicated that the restriction was built into the data. Given that the data had this restriction built-in, it was appropriate to use OLS.

Each observation in the original TFMP survey contained values for each of the five dependent variables. Each observation needed to be transformed so that there was only one dependent variable per observation. To achieve this, the data were arrayed so that each observation was replicated five times, once for each dependent variable (the marketing channel used). All of the other variables in the original observation were identical. So, rather than have 294 observations with 5 dependent variables each, the data set includes 1470 observations, each with one dependent variable. To differentiate the variables associated with each of the marketing channels, each channel's variable name was assigned a prefix corresponding to the appropriate channel.

To model nursery marketing decisions, an Ordinary Least Squares model was created using the Proc Reg feature of the SAS software package (SAS Institute, 1993). The way the data were arrayed allowed the OLS single procedure to estimate all of five equations in the same run. While the model was run with the no intercept option, in the arrayed structure of the data set, the marketing channel dummy variables functioned as intercepts. A separate model was run for both small and large nurseries.

Though single equation OLS using an arrayed data set was the chosen modeling procedure, it was expected that nurseries would gather information and make marketing decisions based on all five channels and not individual channels. Nursery growers do not make decisions to market through a particular channel in a vacuum. They make marketing decisions based on the entire market using the channels that are available. As a result, the error terms of the five individual marketing channel models may be related. The arraying of the data and the resulting increase in sample size should improve the model's significance and goodness of fit.

The Louisiana model was compared with a Gulf States model. The states included in the Gulf States model were Texas, Alabama and Georgia. These states were included because they should have relatively similar climates and markets. It is important to note that the definition of

Gulf States has changed for the marketing characteristic model. Texas did not participate in the 1988 TFMP survey and was not included in the analysis of marketing channel use over time.

Preliminary results of the model were not satisfactory in terms of coefficient significance and goodness of fit. With the objective of improving the model results, generalization of the dependent variable was examined. From its original specification as a proportion, the dependent variable was changed to a categorical variable at three levels: (1) if more than 50% of total sales moved through a given channel, (2) if more than 33% of total sales moved through that channel, and (3) if a nursery had any sales through that channel. With the same set of explanatory variables, these changes did not improve the model results in terms of coefficient significance.

Single equation OLS models were run for the individual marketing channels to test for systematic or structural errors in the model. A modified RESET test was used to test for these errors. The results of the RESET tests indicated that poor model predictive ability was not the result of systematic or structural errors (Appendix F).

The next step taken to improve the coefficient significance and goodness of fit in the model was to divide the data into large and small nurseries. Because large and small nurseries were expected to have different marketing and production characteristics, separate models were estimated for the small and large groups. As with the other analyses, \$200,000 in sales was the dividing line between large and small nurseries. Segregating the data by sales resulted in a total of 28 significant variables for the two models and resulted in improvements for both the significance levels and the goodness of fit measures.

The final model used to estimate marketing channel use is shown in equation 3.1. The example equation is for garden centers, however the equation for each of the other four marketing channels would be identical except for the dependent variable.

Proportion of Sales to Garden Centers = $f(\text{Acres, Advertising Expenditure, Age, Computerization, Contract Production Sales, In-person Sales, In-state Sales, Repeat Customer Sales, Telephone Sales, Use of Four or More Channels, Error})$

Chapter 4

Results

1998 Louisiana Nursery Industry Description

The frequency distribution of Louisiana nurseries, shown in table 4.1, indicates that most Louisiana nurseries were small to medium sized. While there were very few nurseries with sales of greater than \$1 million, these nurseries were relatively evenly distributed among the sales categories.

Table 4.1 – Total Sales for Small and Large Nurseries, Louisiana, 1998

Sales Category (\$)	Number of Observations
Less than \$50,000	114
\$50,000 - \$ 99,999	32
\$100,000 - \$ 249,999	48
\$250,000 - \$ 499,999	22
\$500,000 - \$ 999,999	16
\$1,000,000 - \$1,999,999	10
\$2,000,000 - \$2,999,999	2
\$3,000,000 - \$3,999,999	3
\$4,000,000 - \$4,999,999	3
\$5,000,000 - \$9,999,999	3
\$10,000,000 or above	0

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

Table 4.2 shows a variety of information concerning large and small Louisiana nurseries. On average, small nurseries were younger than large nurseries. Large nurseries had about 6 times more permanent employees than small nurseries and over four times as many temporary employees. Large nurseries had more than 20 times the average total sales as small nurseries.

Table 4.2 – Age, Employment and Total Sales for Small and Large Nurseries, Louisiana, 1998

Category	Size by Sales(\$)	No. of Obs.	Average Year Established	Average No. of Employees		Average Total Sales (\$)
				Permanent	Temporary	
Small	< 200k	193	1985.6	2.158	2.513	70,596
Large	> 200k	60	1976.6	12.517	10.729	1,654,167

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

Table 4.3 shows the percentage of total sales by marketing channel for large and small Louisiana nurseries. Sales to mass-merchandisers were relatively small compared to other marketing channels, but large nurseries' percentage of sales to mass merchandisers was more than twice the percentage for small nurseries. Garden centers were an important marketing channel, garnering over 25% of total sales from both small and large nurseries. Sales to the re-

wholesaler channel represented the largest percentage of total sales, at levels of over 30% for large nurseries and about 35% for small nurseries. The landscaper marketing channel ranked third in use for large and small nurseries. However, while large nurseries used the landscaper channel for 19% of total sales, small nurseries used landscapers for over 26% of total sales. Large nurseries had a higher percentage of sales to the 'other' retailers marketing channel, but neither large nor small nurseries had more than 10% of total sales through the 'other' retail channel.

Table 4.3 – Average Percentage of Sales by Marketing Channel for Small and Large Nurseries, Louisiana, 1998

	Size by Sales (\$)	Marketing Channels				
		Mass Merchandiser	Garden Center	Re-Wholesaler	Landscaper	'Other' Retailer
Small	< 200k	4.193	27.345	34.982	26.526	6.953
Large	> 200k	10.914	29.155	31.276	19.276	9.379

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

While Table 4.3 shows the percentage of large and small nursery producers' sales through the various marketing channels, it is important to remember the difference between the two categories is not just a percentage, but also total dollars.

Table 4.4 shows the total sales through each of the five marketing channels for small and large nurseries. While they represent less than a quarter of the nurseries that reported sales, large nurseries have over seven times the total aggregated sales of small nurseries. While the relative value of a given variable may be similar for small and large nurseries, the level of total sales tells a very different story.

Table 4.4 – Total Industry Sales by Marketing Channel for Small and Large Nurseries, Louisiana, 1998

	Size by Sales (\$)	Marketing Channels				
		Mass Merchandiser	Garden Center	Re-Wholesaler	Landscaper	'Other' Retailer
Small	< 200k	571,294	3,725,760	4,766,360	3,614,211	947,376
Large	> 200k	10,831,940	28,936,509	31,041,293	19,131,293	9,308,966

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

The average monthly sales for small and large nurseries are shown in Table 4.5. The sales pattern for both large and small nurseries was very similar, with high spring sales tapering off in the hot summer months, followed by a modest increase in autumn sales that taper off again in winter. It should be noted that, while the monthly patterns for both large and small nurseries were similar, the large nurseries' pattern has less variation. Sales weighting the percentage of monthly sales would show a dramatic difference between large and small nurseries.

Table 4.5 – Average Monthly Sales for Small and Large Nurseries, Louisiana, 1998

Month	Percentage of Total Sales (%)	
	Small < \$200k	Large > \$200k
January	4.16	7.12
February	7.85	9.91
March	17.39	18.04
April	21.44	17.11
May	15.03	11.23
June	6.51	5.28
July	3.29	3.00
August	2.49	3.28
September	4.33	4.61
October	6.29	7.05
November	6.22	5.60
December	4.99	7.77

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

The percentages of total sales by plant category for small and large Louisiana nurseries are shown in Table 4.6. Sales in most plant categories are similar for both large and small nurseries. Noticeable differences between large and small nurseries exist in the broad-leaved evergreen shrubs, evergreen trees and annual bedding plants category. Large nurseries had a higher percentage of sales in evergreen trees. Despite a longer growing period before return on the investment, larger nurseries may grow these products because they complete the product line and are demanded in the market. Floriculture products comprise most of the relatively large ‘other’ category for both large and small nurseries.

Table 4.6 – Percentage of Total Sales by Plant Category for Small and Large Nurseries, Louisiana, 1998

Plant Category	Percentage of Total Sales (%)	
	Small < \$200k	Large > \$200k
Deciduous shade and flowering trees	10.00	9.93
Deciduous shrubs	3.86	4.03
Broad-leaved evergreen shrubs	9.02	13.20
Narrow-leaved evergreen shrubs	4.32	4.39
Evergreen trees	1.72	8.68
Azaleas	9.64	8.05
Vines and ground covers	8.28	6.71
Bedding Plants – annuals	11.64	16.24
Other	41.53	28.76

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

Table 4.7 illustrates other differences between small and large nurseries. Large nurseries had a higher percentage of sales to out-of-state customers than small nurseries. Small nurseries had a higher average percentage of total sales spent on advertising than large nurseries. However, in terms of average advertising expenditures per nursery, large nurseries spend almost \$68,000 more than small nurseries.

Table 4.7 - In-State and Out-of-State Sales and Advertising Expenditures as a Percentage of Total Sales, Small and Large Nurseries, Louisiana, 1998

	Size by Sales (\$)	Percentage of In-State Sales	Percentage of Out-of-State Sales	Percent of Sales Spent on Advertising	Total Advertising Expenditure (\$)
Small	< 200k	78.07	21.93	6.16	4,348
Large	> 200k	60.52	39.48	4.36	72,140

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

Table 4.8 shows the level of computer use by large and small Louisiana nurseries. Large Louisiana nurseries have far outpaced small nurseries in acquiring and implementing new technology. Large nurseries are at least twice as likely to use all the selected computer functions. The technology gap is especially noticeable in word processing, accounting, inventory, web page use and email. As computers and the Internet become more important production and marketing tools, both large and small nurseries will need to increase their adoption of these technologies to grow.

Table 4.8 – Percentage of Computer Use for Small and Large Nurseries, Louisiana, 1998

Computer Function	Percentage Using Function (%)	
	Small < \$200k	Large > \$200k
Word Processing	21.13	65.00
Accounting	20.62	68.33
Inventory	9.79	48.33
Financial Investments	6.70	25.00
Web Pages	7.73	30.00
CDs	2.06	11.67
e-mail	14.95	41.67
Landscape Design	2.06	8.33
Production Scheduling	3.09	11.67
Greenhouse Production Controls	4.12	8.33

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

Changes in Marketing Channel Use Over Time

The rapid growth in the mass-merchandise channel suggests that marketing channel choices made by nurseries are changing. Analysis of variance was used to determine if marketing channel use had changed for small and large nurseries over the three time periods that TFMP data was collected.

Louisiana 1988-1998

Table 4.9 summarizes the results from the ANOVA tests of differences between means for the survey years for small and large Louisiana nurseries. Only the 1993 vs. 1998 interval for re-wholesalers had no significant differences in the mean for either large or small nurseries.

Table 4.9 - Summary of ANOVA Results Within Marketing Channel by Survey Year Time Interval, Small and Large Louisiana Nurseries, 1988-1998

Channel	Time Interval	Small Nurseries	Large Nurseries
		Mean	Mean
Landscapers	1988 vs. 1993	S	S
	1993 vs. 1998	N	S
	1988 vs. 1998	S	S
Retailers	1988 vs. 1993	N	S
	1993 vs. 1998	S	N
	1988 vs. 1998	N	S
Re-wholesalers	1988 vs. 1993	S	S
	1993 vs. 1998	N	N
	1988 vs. 1998	S	S
		S – significant (0.10 level)	N - not significant

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

Landscaper Channel

The means and standard deviations for large and small Louisiana nursery sales to landscapers from 1988 to 1998 are shown in table 4.10. The mean for small nursery sales to landscapers went from nearly 40% in 1988 to just 17% in 1993 and then rose to 27% in 1998. Large nurseries experienced a similar drop in sales to landscapers. The mean for large nursery sales to landscapers went from 38% in 1988 to just over 10% in 1993 and increased to 20% in 1998.

Table 4.11 shows the analysis of variance for large and small Louisiana nursery sales to landscapers for the intervals from 1988 to 1998. Small nursery sales to landscapers showed a significant drop from 1988 to 1993. Small nursery sales to landscapers showed a significant

Table 4.10 – Mean and Standard Deviation for Louisiana Nurseries' Sales to Landscapers, 1988-1998

Year	Small – Sales < \$200,000			Large – Sales > \$200,000		
	# of obs.	Mean (%)	SD	# of obs.	Mean (%)	SD
1988	28	39.79	36.8	18	37.78	24.87
1993	30	17.13	26.86	37	10.38	12.92
1998	212	26.77	37.30	56	19.96	23.04

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

drop for the entire interval of 1988 to 1998. Large nursery sales to landscapers also showed a significant drop from 1988 to 1993. The analysis of large nursery sales to landscapers from 1993 to 1998 indicated that there was a significant increase in sales to landscapers. Finally, analysis of the overall 1988 to 1998 interval revealed that large nurseries marketed significantly less to landscapers in 1998 than they did in 1988.

Table 4.11 – ANOVA Results for Louisiana Nurseries' Sales to Landscapers, 1988-1998

Interval	Small – Sales < \$200,000		Large – Sales > \$200,000	
	F-Value	Pr > F	F-Value	Pr > F
1988-1993	7.24	0.009**	29.17	0.0001**
1993-1998	1.86	0.174	5.29	0.024 *
1988-1998	3.02	0.0834*	7.84	0.0066**

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - significant at 0.10, ** - significant at 0.05

Retail Channel

Table 4.12 shows the means and standard deviations for large and small Louisiana nursery sales to retailers from 1988 to 1998. The mean for small nursery sales to retailers went from nearly 40% in 1988 to almost 50% in 1993 and then fell to 35% in 1998. The mean for large nursery sales to retailers went from 46% in 1988 to just over 31% in 1993 followed by a small increase to 32% in 1998.

Table 4.12 – Mean and Standard Deviation for Louisiana Nurseries' Sales to Retailers, 1988-1998

Year	Small – Sales < \$200,000			Large – Sales > \$200,000		
	# of obs.	Mean (%)	SD	# of obs.	Mean (%)	SD
1988	28	40.82	39.81	18	45.83	25.97
1993	30	48.87	33.75	37	31.32	30.47
1998	212	35.14	35.02	212	32.39	26.43

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

Table 4.13 shows the analysis of variance for large and small Louisiana nursery sales to retailers for the intervals from 1988 to 1998. Small nursery sales to retailers showed a significant increase from 1993 to 1998. The analysis of large nursery sales to retailers from 1988 to 1993 showed that there was a significant decrease in sales to retailers. Analysis of the overall 1988 to 1998 interval revealed that large nurseries marketed significantly less to retailers in 1998 than they did in 1988.

Table 4.13 – ANOVA Results for Louisiana Nurseries’ Sales to Retailers, 1988-1998

Interval	Small – Sales < \$200,000		Large – Sales > \$200,000	
	F-Value	Pr > F	F-Value	Pr > F
1988-1993	0.69	0.409	3.01	0.089*
1993-1998	4.07	0.045**	0.03	0.858
1988-1998	0.63	0.4282	3.55	0.0635*

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - significant at 0.10, ** - significant at 0.05

Re-wholesaler Channel

Table 4.14 shows the means and standard deviations for large and small Louisiana nursery sales to re-wholesalers from 1988 to 1998. The mean for small nursery sales to re-wholesalers rose from nearly 19% in 1988 to 34% in 1993 and then grew to 38% in 1998. The mean for large nursery sales to re-wholesalers went from 16% in 1988 then jumped to 58% in 1993 followed by a decrease to 48% in 1998.

Table 4.14 – Mean and Standard Deviation for Louisiana Nurseries’ Sales to Re-wholesalers, 1988-1998

Year	Small – Sales < \$200,000			Large – Sales > \$200,000		
	# of obs.	Mean (%)	SD	# of obs.	Mean (%)	SD
1988	28	19.39	31.05	18	16.39	12.70
1993	30	34.00	32.36	37	58.30	33.76
1998	212	38.10	39.34	56	47.64	34.68

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

Table 4.15 shows the analysis of variance for large and small Louisiana nursery sales to re-wholesalers for the intervals from 1988 to 1998. Small nursery sales to re-wholesalers showed a significant increase from 1988 to 1993. The overall interval of 1988 to 1998 for small nursery sales to re-wholesalers indicated that small nurseries sold a significantly larger amount of products to re-wholesalers in 1998 than in 1988. The analysis of large nursery sales to re-wholesalers from 1988 to 1993 showed that there was a significant increase in sales to re-wholesalers. Analysis of the overall 1988 to 1998 interval revealed that large nurseries marketed significantly more to re-wholesalers in 1998 than they did in 1988.

Table 4.15 – ANOVA Results for Louisiana Nurseries' Sales to Re-wholesalers, 1988-1998

Interval	Small – Sales < \$200,000		Large – Sales > \$200,000	
	F-Value	Pr > F	F-Value	Pr > F
1988-1993	3.07	0.085*	25.73	0.001**
1993-1998	0.30	0.587	2.15	0.146
1988-1998	5.84	0.0164**	13.91	0.0004**

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - significant at 0.10, ** - significant at 0.05

Gulf States 1988-1998

While the percentages marketed through the three channels have changed a great deal for Louisiana nurseries, the markets for other Gulf States' nurseries have remained relatively static. Table 4.16 shows how the percentage marketed through each channel have changed over the years for both small and large nurseries. The average percentage for each channel changed only slightly from 1988 to 1998. In fact, only one interval, 1988 versus 1998 (Table 4.18) sales to retailers by small nurseries, showed a significant difference. Small Gulf States nurseries had 73 observations in 1988, 50 observations in 1993 and 57 observations in 1998. Large Gulf States nurseries had 72 observations in 1988, 78 observations in 1993 and 78 observations in 1998. Sample size was smaller because the states included in the Gulf States region collected data with an emphasis on volume of sales within their respective states rather than on the number of producers.

Table 4.16 – Percentage of Total Sales Through Marketing Channels for Small and Large Gulf States Nurseries, 1988-1998

Channel	Year	Small Nurseries		Large Nurseries	
		Mean	STD	Mean	STD
Landscapers	1988	41.06	36.56	35.01	29.46
	1993	41.84	34.14	37.13	32.73
	1998	36.02	39.03	36.47	35.84
Retailers	1988	33.29	33.88	34.61	29.51
	1993	32.84	35.11	38.00	34.77
	1998	44.81	41.33	35.05	35.54
Re-wholesalers	1988	25.69	31.74	30.39	27.62
	1993	25.32	30.33	24.91	31.59
	1998	19.18	32.29	28.47	32.89

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

Table 4.17 shows the mean and standard deviation for Gulf States nurseries' sales to retailers for 1988 and 1998. The percentage of sales from large Gulf States nurseries remained

relatively static over the period, increasing less than half a percent. However, small Gulf States nurseries increased their sales to retailers from 33% in 1988 to nearly 45% in 1998.

Table 4.17 – Mean and Standard Deviation for Gulf States Nurseries' Sales to Retailers, 1988 and 1998

Year	Small – Sales < \$200,000			Large – Sales > \$200,000		
	# of obs.	Mean (%)	SD	# of obs.	Mean (%)	SD
1988	73	33.29	33.88	72	34.61	29.51
1998	57	44.81	41.33	78	35.05	35.54

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

The results from the ANOVA analysis of 1988 versus 1998 Gulf States retailer marketing channel is shown in table 4.18. The ANOVA tests for mean and variance both showed a significant increase in the percentage marketed through retailers from 1988 to 1998. However, the retail markets gain did not come at a significant loss of sales to re-wholesalers or landscapers.

Table 4.18 – ANOVA Results for Gulf States Nurseries' Sales to Retailers, 1988 vs. 1998

Interval	Small – Sales < \$200,000		Large – Sales > \$200,000	
	F-Value	Pr > F	F-Value	Pr > F
1988-1998	3.05	0.0832*	0.01	0.9346

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - significant at 0.10, ** - significant at 0.05

Estimating Marketing Channel Use

Models were estimated to measure the impact of selected factors on the percentage of sales through the five marketing channels. These models should provide an idea of what characteristics will make a nursery more likely to market products through one channel or another.

The Small Louisiana Nursery Model

Table 4.19 shows measurement of the overall significance and goodness of fit for the small Louisiana nursery system of equations. The model has an F value of 12.49 and is significantly different from zero. The model explains 39% of small Louisiana nursery marketing choices, as measured by the adjusted R^2 .

The parameter estimates for small Louisiana nurseries' sales to mass merchandisers are shown in table 4.20. None of the parameter estimates were found to be significantly different from zero. This was an expected result. Since mass merchandisers tend to do business with relatively large suppliers, it makes sense that small producers' marketing strategies pertaining to mass merchandisers would produce insignificant results. Individual OLS models were run for each marketing channel. The correlation coefficient for these individual models will be reported

to compare the system model's goodness of fit to the individual OLS models. The individual OLS model for Louisiana small nursery sales to mass merchandisers had a correlation coefficient of 0.0485.

Table 4.19 Model Significance and Goodness of Fit for the 1998 Small Louisiana Nurseries Model

F Value	12.49
Prob F > 0	0.0001
R ²	0.4248
Adjusted R ²	0.3908
# of Observations	985

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

Table 4.21 shows the results of the small Louisiana nursery producer's garden center equation. GC, the dummy intercept variable for garden centers, was significant and had a value of 25.11. Contract sales, GCCON, had a significant and negative impact on a small nursery's percentage of sales. A \$100,000 increase in contract sales will decrease small Louisiana nursery sales to garden centers by 0.334. GCIN, small nursery in-state sales, had a positive and significant impact on the percentage of sales to garden centers. A \$100,000 increase in in-state sales will increase small Louisiana nursery sales to garden centers by 0.276. GCPER, in-person sales, and GCTEL, telephone sales, both had significant and negative impacts on the percentage of sales to garden centers. A \$100,000 increase in in-person sales will result in a 0.317 drop in sales to garden centers while a \$100,000 increase in telephone sales will cause a 0.397 drop in small nursery sales to garden centers. Sales to repeat customers, GCRE, were positive and significant. A \$100,000 increase in sales to repeat customers will result in a 0.206 increase in small Louisiana nursery sales to garden centers. It seems counter-intuitive that both of the major

Table 4.20 - Results from the 1998 Small Louisiana Nursery Mass Merchandiser Equation

Variable	Parameter Estimate	Standard Error	T for H0:	Prob > |T|
MM	3.108066000	3.08338484	1.008	0.3137
MMACRES	-0.323426000	0.69968560	-0.462	0.6440
MMAD	-0.000000095	0.00000419	-0.023	0.9818
MMAGE	-0.002737000	0.00706969	-0.387	0.6987
MMCOMPU	-4.235046000	5.40376562	-0.784	0.4334
MMCON	-0.000000307	0.00000143	-0.214	0.8307
MMGT3CH	9.671608000	8.97666739	1.077	0.2816
MMIN	0.000000635	0.00000089	0.717	0.4736
MMPER	0.000000388	0.00000123	0.316	0.7523
MMRE	-0.000000452	0.00000124	-0.364	0.7159
MMTEL	0.000000363	0.00000123	0.294	0.7688

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

transaction methods used in the nursery industry would have a negative effect on the percentage of sales through garden centers. This could indicate that small nurseries have maximized their marketing potential in the garden center channel and are focusing on marketing activities that will cause growth in other marketing channels. GCCON, CGIN, GCPER and GCRE all had their expected impact on the small nursery garden center equation. The individual OLS for the small Louisiana garden center equation had a correlation coefficient of 0.0617. This correlation coefficient seems very low for a core marketing channel.

Table 4.21 – Results from the 1998 Small Louisiana Nursery Garden Center Equation

Variable	Parameter Estimate	Standard Error	T for H0:	Prob > |T|
GC	25.106986	3.08338484	8.143	0.0001**
GCACRES	-0.395115	0.6996856	-0.565	0.5724
GCAD	-0.00000082	0.00000419	-0.196	0.8448
GCAGE	-0.00557600	0.00706969	-0.789	0.4305
GCCOMPU	8.22196300	5.40376562	1.522	0.1285
GCCON	-0.00000334	0.00000143	-2.330	0.0200**
GCGT3CH	2.24184200	8.97666739	0.250	0.8028
GCIN	0.00000276	0.00000089	3.104	0.0020**
GCPER	-0.00000317	0.00000123	-2.583	0.0100**
GCRE	0.00000206	0.00000124	1.659	0.0975*
GCTEL	-0.00000397	0.00000123	-3.213	0.0014**

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

Results for the small Louisiana nurseries' 'other' retailer equation are shown in table 4.22. The dummy intercept variable was the only significant variable, with a parameter estimate of 10.49. None of the other parameter estimates for 'other' retailers were significantly different from zero. The 'other' retailer individual OLS equation for small Louisiana nurseries had a correlation coefficient of 0.0251.

Table 4.22 – Results from the 1998 Small Louisiana Nursery 'Other' Retailers Equation

Variable	Parameter Estimate	Standard Error	T for H0:	Prob > |T|
OR	10.494141000	3.08338484	3.403	0.0007**
ORACRES	-0.450927000	0.69968560	-0.644	0.5194
ORAD	0.000000863	0.00000419	0.206	0.8368
ORAGE	-0.004130000	0.00706969	-0.584	0.5592
ORCOMPU	-0.492221000	5.40376562	-0.091	0.9274
ORCON	-0.000000990	0.00000143	-0.691	0.4899
ORGT3CH	6.553964000	8.97666739	0.730	0.4655
ORIN	0.000000624	0.00000089	0.704	0.4814
ORPER	-0.000000167	0.00000123	-0.136	0.8921
ORRE	-0.000000411	0.00000124	-0.331	0.7407
ORTEL	-0.000000617	0.00000123	-0.500	0.6171

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

Table 4.23 shows the equation for small Louisiana nurseries sales to landscapers. The dummy intercept variable, LD, had a significant value of 35.05. LDAGE, the age of the small nursery, had a significant and negative impact on the percentage of sales to landscapers of -0.014. This estimate makes sense based on the expectations of small nurseries. Initially, a new nursery is expected to try and maximize sales through garden centers and landscapers, as those channels offer the most profitability to growers. However, as a nursery ages, it is presumed that the nursery will attempt to grow the business by diversifying its marketing strategy which could have the impact of reducing the percentage of sales to landscapers. The LDCON variable was almost significant. This variable indicated a negative relationship between contract sales and the landscaper marketing channel. The individual OLS equation for small Louisiana nursery sales to landscapers had a correlation coefficient of 0.0368. Like the individual model for garden centers, the correlation coefficient for the individual OLS landscaper equation seems very low for a core marketing channel.

Table 4.23 – Results from the 1998 Small Louisiana Nursery Landscaper Equation

Variable	Parameter Estimate	Standard Error	T for H0:	Prob > |T|
LD	35.048936000	3.08338484	11.367	0.0001**
LDACRES	0.966148000	0.69968560	1.381	0.1677
LDAD	0.000002563	0.00000419	0.612	0.5407
LDAGE	-0.013521000	0.00706969	-1.913	0.0561*
LDCOMPU	-5.394664000	5.40376562	-0.998	0.3184
LDCON	-0.000002294	0.00000143	-1.600	0.1099
LDGT3CH	-1.534875000	8.97666739	-0.171	0.8643
LDIN	0.000000320	0.00000089	0.361	0.7183
LDPER	0.000000214	0.00000123	0.174	0.8620
LDRE	-0.000000467	0.00000124	-0.377	0.7064
LDTEL	0.000000427	0.00000123	0.346	0.7296

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

The results of the small Louisiana nursery grower's re-wholesaler equation are shown in table 4.24. RW, the dummy intercept was significant and had a parameter estimate of 26.24. Nursery age, RWAGE, had a positive and significant impact of 0.026 on small nursery sales to re-wholesalers. This was an unexpected result, since it was believed that younger nurseries would be more likely to use the re-wholesaler channel. Contract production, RWCON, had a significant and positive effect on the percentage of sales to re-wholesalers. A \$100,000 increase in contract sales would result in a 0.6933 increase in small Louisiana nursery sales to re-wholesalers. RWGT3CH, the dummy variable indicating whether a nursery sells through 4 or more marketing channels, had a significant and effect of -16.93 on the percentage of sales to re-wholesalers. So, if a nursery sells to four or more marketing channels, the percentage sold through the re-wholesaler channel is lower by 17%. Re-wholesalers sell nursery products to landscapers, garden centers, mass-merchandisers and 'other' retailers. While unlikely, if a small nursery had marketing relationships with agents in these marketing channels, they would have less need to use re-wholesalers as a marketing channel. In-state sales, RWIN, had a significant and negative effect on the percentage of sales to re-wholesalers. A \$100,000 increase in the in-

states sales would result in a 0.4328 decrease in small Louisiana nursery sales to re-wholesalers. In-person sales, RWPER, and telephone sales, RWTEL, had a significant and positive influence on the percentage of sales to re-wholesalers. A \$100,000 increase in in-person sales would result in a 0.2739 increase in small Louisiana nursery sales to re-wholesalers. If telephone sales were to increase \$100,000, the percentage small Louisiana nurseries sell to re-wholesalers would increase by 0.3793. It is odd that the two major transaction methods for nursery sales both have a positive impact on sales to re-wholesalers. The individual OLS equation for small Louisiana nursery sales to re-wholesalers had a correlation coefficient of 0.1721.

Table 4.24 - Results from the 1998 Small Louisiana Nursery Re-Wholesaler Equation

Variable	Parameter Estimate	Standard Error	T for H0:	Prob > |T|
RW	26.241871000	3.08338484	8.511	0.0001**
RWACRES	0.203320000	0.69968560	0.291	0.7714
RWAD	-0.000002510	0.00000419	-0.599	0.5491
RWAGE	0.025964000	0.00706969	3.673	0.0003**
RWCOMPU	1.899968000	5.40376562	0.352	0.7252
RWCON	0.000006933	0.00000143	4.835	0.0001**
RWGT3CH	-16.932539000	8.97666739	-1.886	0.0596*
RWIN	-0.000004328	0.00000089	-4.887	0.0001**
RWPER	0.000002739	0.00000123	2.229	0.0261**
RWRE	-0.000000728	0.00000124	-0.587	0.5576
RWTEL	0.000003793	0.00000123	3.073	0.0022**

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

The Large Louisiana Nursery Model

Table 4.25 shows the goodness of fit and overall model significance for the 1998 large Louisiana nursery system of equations. The model has an F value of 11.99 and the probability that this F value is greater than zero is 0.0001, demonstrating that the model is significant in explaining large Louisiana nurseries' marketing decisions. The adjusted R² indicates that the model explained 48% of large Louisiana nursery producers' marketing decisions. The results of each marketing channel's equation are shown in the tables that follow.

Table 4.25 Model Significance and Goodness of Fit for the 1998 Large Louisiana Nurseries Model

F Value	11.99
Prob F > 0	0.0001
R ²	0.5279
Adjusted R ²	0.4839
# of Observations	270

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

The results for the large Louisiana nursery mass merchandiser equation are shown in table 4.26. MMCON, contract production sales, is significant and has an impact of 0.025 on the percentage of sales for mass merchandisers for every \$100,000 of contract sales. A positive impact from contract production follows the expectation that mass merchandisers prefer to do business through contracts with growers. The use of 4 or more marketing channels, MMGT3CH, is significant and has a value of 16.8. This result was expected and may imply that the mass merchandiser channel is one of the last channels to be pursued by growers. The individual OLS equation for large Louisiana nursery sales to mass merchandisers had a correlation coefficient of 0.2484.

Table 4.26 - Results from the 1998 Large Louisiana Nursery Mass Merchandiser Equation

Variable	Parameter Estimate	Standard Error	T for H0:	Prob > |T|
MM	6.42854100	8.22610635	0.781	0.4354
MMACRES	0.01937300	0.17560373	0.110	0.9123
MMAD	-0.00000005	0.00000049	-0.096	0.9235
MMAGE	-0.00681200	0.27584039	-0.025	0.9803
MMCOMPU	-1.73547600	6.79203775	-0.256	0.7986
MMCON	0.00000025	0.00000013	1.958	0.0515*
MMGT3CH	16.80369200	8.66773972	1.939	0.0539*
MMIN	0.00000001	0.00000006	0.089	0.9293
MMPER	-0.00000008	0.00000011	-0.764	0.4459
MMRE	0.00000002	0.00000011	0.203	0.8394
MMTEL	-0.00000005	0.00000011	-0.422	0.6731

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

Table 4.27 shows the results of the garden center equation for large Louisiana nurseries. GC, the dummy intercept was significant and had a value of 16.50. Use of three or more

Table 4.27 - Results from the 1998 Large Louisiana Nursery Garden Center Equation

Variable	Parameter Estimate	Standard Error	T for H0:	Prob > |T|
GC	16.49747500	8.22610635	2.006	0.0462**
GCACRES	0.01602100	0.17560373	0.091	0.9274
GCAD	-0.00000032	0.00000049	-0.649	0.5172
GCAGE	0.19155500	0.27584039	0.694	0.4882
GCCOMPU	14.64473500	6.79203775	2.156	0.0322**
GCCON	-0.00000030	0.00000013	-2.372	0.0186**
GCGT3CH	-10.36766200	8.66773972	-1.196	0.2330
GCIN	0.00000017	0.00000006	2.785	0.0058**
GCPER	0.00000001	0.00000011	0.102	0.9190
GCRE	0.00000004	0.00000011	0.328	0.7430
GCTEL	-0.00000009	0.00000011	-0.854	0.3939

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

computer functions, GCCOMPU, was significant and had an estimated value of 14.65. This result was unexpected, since higher levels of computerization were expected to have a negative impact on the core marketing channels and a positive impact on the growth channels. GCCON, total contract sales, had a negative impact on the percentage of sales to garden centers of 0.03 for a \$100,000 increase in contract sales. The implication of this expected result is that other marketing channels may be more conducive to contract production than garden centers. In-state sales, GCIN, had a significant impact on the percentage of sales to garden centers of 0.017 for \$100,000 increase in in-state sales. This result meets the expectation that garden centers are local businesses, typically in close proximity to the nurseries that supply them. The large Louisiana nursery sales to garden centers individual OLS equation had a correlation coefficient of 0.2833.

Table 4.28 shows the results of the large Louisiana nursery ‘other’ retailer equation. ORCON, total contract production, was the only significant variable in this equation. The result indicated that a \$100,000 increase in contract production would result in a 0.032 increase in sales to other retailers. The estimated parameter showed that increases in contract production had a positive impact on the percentage of sales to ‘other’ retailers. The individual OLS equation for large Louisiana nursery sales to ‘other’ retailers had a correlation coefficient of 0.3619. The correlation coefficient for the other retailer individual OLS model is unexpectedly high given that it is a catchall category.

Table 4.28 – Results from the 1998 Large Louisiana Nursery ‘Other’ Retailers Equation

Variable	Parameter Estimate	Standard Error	T for H0:	Prob > |T|
OR	6.70867600	8.22610635	0.816	0.4157
ORACRES	-0.11503400	0.17560373	-0.655	0.5131
ORAD	-0.00000028	0.00000049	-0.579	0.5631
ORAGE	-0.05746600	0.27584039	-0.208	0.8352
ORCOMPU	6.39108600	6.79203775	0.941	0.3478
ORCON	0.00000032	0.00000013	2.505	0.0130**
ORGT3CH	12.54469500	8.66773972	1.447	0.1493
ORIN	-0.00000003	0.00000006	-0.449	0.6537
ORPER	0.00000005	0.00000011	0.431	0.6670
ORRE	-0.00000014	0.00000011	-1.183	0.2383
ORTEL	0.00000012	0.00000011	1.065	0.2881

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

Results from the large Louisiana nursery growers’ landscaper equation are shown in table 4.29. LD, the dummy intercept was the only significant variable and had a value of 37.88. The individual OLS equation for large Louisiana nursery sales to landscapers had a correlation coefficient of 0.1662.

Table 4.30 shows the results for large Louisiana nurseries re-wholesaler equation. The dummy intercept variable, RW, was significant and had a value of 32.79. RWCOMPU, the dummy variable indicating whether a nursery used three or more computer functions, had a significant and negative impact on the percentage of sales to re-wholesalers of –13.85. This unexpected result indicates that large nurseries that use a lot of computer functions are less likely

to use the re-wholesaler channel. Whether a nursery used 4 or more marketing channels, RWGT3CH, also had a significant and negative impact on the percentage of sales to re-wholesalers, with a parameter estimate of -14.49. As expected, when a nursery adopts a diversified marketing strategy, it does so at the expense of sales to re-wholesalers. Finally, RWIN, total in-state sales, had a significant and negative impact on the percentage of sales to re-wholesalers. A \$100,000 increase in in-state sales would result in a 0.013 decrease in the percentage of large Louisiana nursery sales to re-wholesalers. This result was expected and implies that Louisiana nurseries sell primarily to out-of-state re-wholesalers. The individual OLS equation large Louisiana nursery sales to re-wholesalers had an R^2 of 0.3721.

Table 4.29 - Results from the 1998 Large Louisiana Nursery Landscaper Equation

Variable	Parameter Estimate	Standard Error	T for H0:	Prob > |T|
LD	37.87804000	8.22610635	4.605	0.0001**
LDACRES	0.15561900	0.17560373	0.886	0.3765
LDAD	-0.00000005	0.00000049	-0.093	0.9257
LDAGE	-0.07106800	0.27584039	-0.258	0.7969
LDCOMPU	-5.45306600	6.79203775	-0.803	0.4229
LDCON	-0.00000019	0.00000013	-1.518	0.1306
LDGT3CH	-4.48632000	8.66773972	-0.518	0.6053
LDIN	-0.00000001	0.00000006	-0.172	0.8640
LDPER	-0.00000002	0.00000011	-0.144	0.8854
LDRE	0.00000008	0.00000011	0.722	0.4711
LDTEL	-0.00000008	0.00000011	-0.774	0.4397

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

Table 4.30 - Results from the 1998 Large Louisiana Nursery Re-wholesaler Equation

Variable	Parameter Estimate	Standard Error	T for H0:	Prob > |T|
RW	32.48726700	8.22610635	3.949	0.0001**
RWACRES	-0.07597800	0.17560373	-0.433	0.6657
RWAD	0.00000069	0.00000049	1.417	0.1578
RWAGE	-0.05620900	0.27584039	-0.204	0.8387
RWCOMPU	-13.84727800	6.79203775	-2.039	0.0427**
RWCON	-0.00000007	0.00000013	-0.573	0.5671
RWGT3CH	-14.49440500	8.66773972	-1.672	0.0959*
RWIN	-0.00000013	0.00000006	-2.253	0.0253**
RWPER	0.00000004	0.00000011	0.375	0.7079
RWRE	-0.00000001	0.00000011	-0.071	0.9436
RWTEL	0.00000011	0.00000011	0.986	0.3252

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

The Small Gulf States Nursery Model

The Gulf States models used TFMP data from states with similar production and marketing characteristics to Louisiana. Data from Alabama, Georgia and Texas nurseries will be helpful in determining how the Louisiana wholesale nursery industry differs from that of other states in the region. Several statistics for the small nursery Gulf States model are shown in Table 4.31. The model had an F value of 17.32, which was significantly different from zero. The adjusted R^2 showed that the small nursery model for the Gulf States explained about 41% of the variation in sales to the five marketing channels.

Table 4.31 Model Significance and Goodness of Fit for the 1998 Small Gulf States Nurseries Model

F Value	6.1
Prob >F	0.0001
R^2	0.4892
Adjusted R^2	0.4089
# of Observations	405

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

Table 4.32 shows the mass merchandiser equation for small Gulf States nursery producers. As with the small Louisiana nursery mass-merchandiser equation, none of the variables for the small Gulf States nurseries were significant. Again, this was expected, since mass-merchandisers are not expected to do business with small nursery producers. The single equation OLS for small Gulf States nursery sales to mass merchandisers was 0.1092.

Table 4.32 – Results from the 1998 Small Gulf States nursery Mass Merchandiser Equation

Variable	Parameter Estimate	Standard Error	T-value	Prob > T
MM	4.582265000	6.931679570	0.6610	0.5090
MMACRES	-0.118764000	0.396646200	-0.2990	0.7648
MMAD	-0.000000678	0.000003280	-0.2070	0.8361
MMAGE	-0.069192000	0.271115410	-0.2550	0.7987
MMCOMPU	0.430355000	6.978192290	0.0620	0.9509
MMCON	0.000001426	0.000003380	0.4220	0.6732
MMGT3CH	-0.362775000	16.433572300	-0.0220	0.9824
MMIN	-0.000000429	0.000001260	-0.3400	0.7343
MMPER	-0.000000309	0.000001380	-0.2240	0.8233
MMRE	0.000000087	0.000000280	0.3160	0.7519
MMTEL	0.000001089	0.000001350	0.8060	0.4207

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

The garden center equation for small Gulf State nurseries is shown in table 4.33. The only significant variable was the intercept, GC, with a value of 45.8. The individual OLS equation for small Gulf States nursery sales to garden centers had a correlation coefficient of

0.077. This is a low correlation coefficient given that the garden center channel is a core marketing channel.

Table 4.33 – Results from the 1998 Small Gulf States Nursery Garden Center Equation

Variable	Parameter Estimate	Standard Error	T-value	Prob > T
GC	45.799146000	6.931679570	6.6070	0.0001**
GCACRES	-0.066352000	0.396646200	-0.1670	0.8672
GCAD	-0.000005146	0.000003280	-1.5700	0.1172
GCAGE	-0.116378000	0.271115410	-0.4290	0.6680
GCCOMPU	0.507793000	6.978192290	0.0730	0.9420
GCCON	0.000002861	0.000003380	0.8470	0.3976
GCGT3CH	-22.887787000	16.433572300	-1.3930	0.1646
GCIN	-0.000000833	0.000001260	-0.6590	0.5100
GCPER	0.000000672	0.000001380	0.4860	0.6272
GCRE	-0.000000244	0.000000280	-0.8870	0.3759
GCTEL	-0.000000031	0.000001350	-0.0230	0.9818

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

Table 4.34 shows the results for the small Gulf States nursery ‘other’ retailer model. ORPER, in-person sales, and ORTEL, sales over the phone, were significant and had a negative impact on the percentage of sales to ‘other’ retailers, an unexpected result. A \$100,000 increase in in-person sales would result in a 0.3483 decrease in the percentage of small nursery sales to other retailers. If telephone sales were to increase \$100,000, small Gulf States nursery sales to other retailers will decrease 0.3909. This may indicate that the ‘other’ retailer channel is a less

Table 4.34 - Results from the 1998 Small Gulf States Nursery ‘Other’ Retailer Equation

Variable	Parameter Estimate	Standard Error	T-value	Prob > T
OR	3.954385000	6.931679570	0.5700	0.5687
ORACRES	-0.112772000	0.396646200	-0.2840	0.7763
ORAD	-0.000000908	0.000003280	-0.2770	0.7820
ORAGE	0.007926000	0.271115410	0.0290	0.9767
ORCOMPU	2.464193000	6.978192290	0.3530	0.7242
ORCON	0.000003402	0.000003380	1.0070	0.3147
ORGT3CH	3.232456000	16.433572300	0.1970	0.8442
ORIN	0.000003896	0.000001260	3.0840	0.0022**
ORPER	-0.000003483	0.000001380	-2.5190	0.0122**
ORRE	0.000000012	0.000000280	0.0430	0.9658
ORTEL	-0.000003909	0.000001350	-2.8930	0.0041**

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

preferred channel for nurseries. If the two major transaction methods have negative signs, it indicates that as a nursery’s sales increase the proportion of sales through ‘other’ retailers will

decrease. ORIN, in-state sales, had a significant and positive impact on the percentage of sales to 'other' retailers. A \$100,000 increase in in-states sales will result in a 0.3896 increase in small Gulf States nursery sales to other retailers. This indicates that nurseries that sell more in state typically sell more to 'other' retailers. The single equation OLS for small Gulf States nursery sales to 'other' retailers had a correlation coefficient of 0.2629. This estimate seems relatively high since the other retailer channel is not expected to be a major marketing channel choice for nurseries.

The small Gulf States nursery equation for landscapers is shown in table 4.35. The intercept was significant for the small Gulf States nursery equation. Advertising, LDAD, had a positive effect on the percentage of sales to landscapers. A \$100,000 increase in advertising expenditure will result in a 0.7764 increase small Gulf States nursery sales to landscapers. This is an unexpected result, as advertising should have a negative impact on sales to the core marketing channels. LDCON had a negative effect on the percentage of sales to landscapers. A \$100,000 increase in contract sales will result in a 0.6311 decrease in small Gulf States nursery sales to landscapers. This indicates that contract production would increase sales to other marketing channels at the expense of landscapers. The individual OLS equation for small Gulf States nursery sales to landscapers had a correlation coefficient of 0.1684.

Table 4.35 - Results from the 1998 Small Gulf States Nursery Landscaper Equation

Variable	Parameter Estimate	Standard Error	T-value	Prob > T
LD	27.478661000	6.931679570	3.9640	0.0001**
LDACRES	0.578783000	0.396646200	1.4590	0.1454
LDAD	0.000007764	0.000003280	2.3690	0.0184**
LDAGE	-0.080455000	0.271115410	-0.2970	0.7668
LDCOMPU	1.971714000	6.978192290	0.2830	0.7777
LDCON	-0.000006311	0.000003380	-1.8680	0.0626*
LDGT3CH	-18.469595000	16.433572300	-1.1240	0.2618
LDIN	-0.000001170	0.000001260	-0.9260	0.3550
LDPER	0.000002254	0.000001380	1.6300	0.1039
LDRE	0.000000180	0.000000280	0.6550	0.5132
LDTEL	0.000000947	0.000001350	0.7010	0.4839

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

Table 4.36 shows the results for the small Gulf States nursery re-wholesaler equation. RW, the re-wholesaler channel intercept, was significant and had a value of 18.19. RWGT3CH, the variable indicating whether a nursery used 4 or more marketing channels, was significant and had a value of 38.49. This unexpected result implies that if a nursery sells to four or more channels, the percentage of sales through the re-wholesaler channel was higher by almost 40%. The single equation OLS model for small Gulf States nursery sales to re-wholesalers had a correlation coefficient of 0.1238.

Table 4.36 - Results from the 1998 Small Gulf States Nursery Re-wholesaler Equation

Variable	Parameter Estimate	Standard Error	T-value	Prob > T
RW	18.185544000	6.931679570	2.6240	0.0091**
RWACRES	-0.280895000	0.396646200	-0.7080	0.4793
RWAD	-0.000001033	0.000003280	-0.3150	0.7528
RWAGE	0.258099000	0.271115410	0.9520	0.3418
RWCOMPU	-5.374056000	6.978192290	-0.7700	0.4417
RWCON	-0.000001377	0.000003380	-0.4080	0.6837
RWGT3CH	38.487700000	16.433572300	2.3420	0.0197**
RWIN	-0.000001463	0.000001260	-1.1580	0.2475
RWPER	0.000000866	0.000001380	0.6260	0.5315
RWRE	-0.000000035	0.000000280	-0.1270	0.8989
RWTEL	0.000001904	0.000001350	1.4090	0.1598

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

The Large Gulf States Nursery Model

General statistics for the large Gulf States model are shown in table 4.37. The model had an F value of 16.29 and was significantly different from zero. The adjusted R^2 showed that the system of equations explains 46% of the variation in large Gulf State nurseries marketing decisions. The equations for each of the five market channels for large Gulf States nurseries are discussed below.

Table 4.37 Model Significance and Goodness of Fit for the 1998 Large Gulf States Nurseries Model

F Value	11.41
Prob >F	0.0001
R^2	0.4951
Adjusted R^2	0.4517
# of Observations	695

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

Table 4.38 shows the results for the large Gulf States nursery mass merchandiser equation. MMCON, contract production sales, had a significant and positive effect on sales to mass-merchandisers. A \$100,000 increase in contract production will result in a 0.058 increase in large Gulf States nursery sales to mass-merchandisers. This is an expected result, as mass-merchandisers tend to use contract production for nursery products. MMT3CH, the dummy variable indicating whether a nursery used 4 or more channels, was significant and had a parameter estimate of 16.92. If a nursery sells to 4 or more channels, the percentage of sales to mass merchandisers was higher by almost 17%. The single equation OLS model for large Gulf States nursery sales to mass merchandisers had a correlation coefficient of 0.3195.

Table 4.38 – Results from the 1998 Large Gulf States Nursery Mass Merchandiser Equation

Variable	Parameter Estimate	Standard Error	T-value	Prob > T
MM	0.390524000	5.065226600	0.0770	0.9386
MMACRES	0.065372000	0.079342670	0.8240	0.4103
MMAD	-0.000000096	0.000000270	-0.3510	0.7258
MMAGE	-0.004938000	0.021016330	-0.2350	0.8143
MMCOMPU	4.018975000	5.499903740	0.7310	0.4652
MMCON	0.000000058	0.000000020	2.9920	0.0029**
MMGT3CH	16.920545000	5.052552270	3.3490	0.0009**
MMIN	-0.000000017	0.000000020	-0.9550	0.3398
MMPER	-0.000000011	0.000000020	-0.4530	0.6504
MMRE	0.000000041	0.000000030	1.5170	0.1299
MMTEL	-0.000000041	0.000000030	-1.3830	0.1672

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

The parameter estimates for large Gulf States nursery's sales to garden centers are shown in table 4.39. GC, the garden center intercept variable, was significant and had a value of 22.28. GCCON, contract production sales, was significant and negative, demonstrating that increases in contract production are done at the expense of the garden center channel. A \$100,000 increase in contract sales will result in a 0.0035 percent decrease in the percentage of sales by large Gulf States nurseries to garden centers. The single equation OLS model for large Gulf States nurseries sales to garden centers had a correlation coefficient of 0.0538. Like the small Gulf States individual channel OLS garden center model, the correlation coefficient seems very low for what is believed to be a core marketing channel.

Table 4.39 – Results from the 1998 Large Gulf States Nursery Garden Center Equation

Variable	Parameter Estimate	Standard Error	T-value	Prob > T
GC	22.281472000	5.065226600	4.3990	0.0001**
GCACRES	-0.042730000	0.079342670	-0.5390	0.5904
GCAD	-0.000000321	0.000000270	-1.1730	0.2412
GCAGE	-0.002110000	0.021016330	-0.1000	0.9201
GCCOMPU	-0.352987000	5.499903740	-0.0640	0.9488
GCCON	-0.000000035	0.000000020	-1.7880	0.0742*
GCGT3CH	3.355041000	5.052552270	0.6640	0.5069
GCIN	-0.000000012	0.000000020	-0.6900	0.4905
GCPER	0.000000019	0.000000020	0.7700	0.4414
GCRE	-0.000000012	0.000000030	-0.4600	0.6457
GCTEL	0.000000042	0.000000030	1.4230	0.1551

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

Table 4.40 displays the results for the large Gulf states nursery ‘other’ retailers equation. None of the estimated parameters for the ‘other’ retailer channel were significant. The individual OLS equation for large Gulf States nursery sales to ‘other’ retailers had a correlation coefficient of 0.0954.

Table 4.40– Results from the 1998 Large Gulf States Nursery ‘Other’ Retailers Equation

Variable	Parameter Estimate	Standard Error	T-value	Prob > T
OR	3.803260000	5.065226600	0.7510	0.4530
ORACRES	-0.078024000	0.079342670	-0.9830	0.3258
ORAD	-0.000000185	0.000000270	-0.6760	0.4993
ORAGE	-0.004118000	0.021016330	-0.1960	0.8447
ORCOMPU	-0.069965000	5.499903740	-0.0130	0.9899
ORCON	-0.000000003	0.000000020	-0.1740	0.8617
ORGT3CH	6.225427000	5.052552270	1.2320	0.2184
ORIN	-0.000000010	0.000000020	-0.5710	0.5683
ORPER	0.000000006	0.000000020	0.2250	0.8220
ORRE	-0.000000002	0.000000030	-0.0650	0.9480
ORTEL	0.000000029	0.000000030	0.9750	0.3299

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

Results for the large Gulf States nursery landscaper equation are shown in table 4.41. The intercept variable, LD, was significant and had an estimated value of 43.75. As with small Gulf States nurseries, advertising had an unexpected positive and significant impact on sales to landscapers. Contract production, LDCON, had a significant and negative impact on the percentage of sales to landscapers. A \$100,000 in contract production will result in a 0.004 decrease in the percentage of large Gulf States nursery sales to landscapers. As expected, as a nursery sold to more and more channels, the percentage sold to landscapers fell. LDGT3CH, had a significant and negative impact of over 11% on the percentage of sales to landscapers. In-state sales, LDIN, had a significant and positive impact on the percentage of sales to landscapers. A \$100,000 increase in advertising expenditures will result in a 0.0764 increase in the percentage of large Gulf States nursery sales to landscapers. This is an expected result as landscapers are expected to be local customers for nurseries. LDAD had a significant and positive impact on the percentage of sales to mass-merchandisers. Texas and Georgia nurseries support several large metropolitan areas, so increases in advertising would be expected to increase sales for these nurseries. Finally, LDRE, sales to repeat customers, had a negative impact on the percentage of sales to landscapers. A \$100,000 increase in sales to repeat customers will result in a 0.052 decrease in the percentage of large Gulf States nursery sales to landscapers. This was an unexpected result, given the belief that landscapers tend to build and maintain relationships with nurseries in order to secure a supply of quality plants. The single equation OLS model for large Gulf States nursery sales to landscapers has a correlation coefficient of 0.1616.

Table 4.41 – Results from the 1998 Large Gulf States Nursery Landscaper Equation

Variable	Parameter Estimate	Standard Error	T-value	Prob > T
LD	43.751381000	5.065226600	8.6380	0.0001**
LDACRES	0.036188000	0.079342670	0.4560	0.6485
LDAD	0.000000764	0.000000270	2.7920	0.0054**
LDAGE	-0.027392000	0.021016330	-1.3030	0.1929
LDCOMPU	0.197619000	5.499903740	0.0360	0.9713
LDCON	-0.000000040	0.000000020	-2.0470	0.0410**
LDGT3CH	-11.409545000	5.052552270	-2.2580	0.0243**
LDIN	0.000000060	0.000000020	3.3400	0.0009**
LDPER	0.000000006	0.000000020	0.2390	0.8113
LDRE	-0.000000052	0.000000030	-1.9490	0.0518*
LDTEL	-0.000000040	0.000000030	-1.3650	0.1728

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

Table 4.42 shows the results for the large Gulf States nursery re-wholesaler equation. RW, the re-wholesalers dummy intercept, was significant and had a value of 29.77. RWAGE, nursery age, had a significant and positive impact on the percentage of sales through the re-wholesaler channel. As nurseries aged, they used the re-wholesaler channel more. RWGT3CH had a significant and negative impact on the percentage of sales to re-wholesalers. Other factors constant, if a nursery sold to 4 or more marketing channels, they reduced the percentage of sales through the re-wholesaler channel by 15%. The individual OLS equation for large Gulf States nursery sales to re-wholesalers had a correlation coefficient of 0.0814.

Table 4.42 – Results from the 1998 Large Gulf States Nursery Re-wholesaler Equation

Variable	Parameter Estimate	Standard Error	T-value	Prob > T
RW	29.773363000	5.065226600	5.8780	0.0001**
RWACRES	0.019195000	0.079342670	0.2420	0.8089
RWAD	-0.000000162	0.000000270	-0.5930	0.5537
RWAGE	0.038558000	0.021016330	1.8350	0.0670*
RWCOMPU	-3.793640000	5.499903740	-0.6900	0.4906
RWCON	0.000000020	0.000000020	1.0170	0.3093
RWGT3CH	-15.091469000	5.052552270	-2.9870	0.0029**
RWIN	-0.000000020	0.000000020	-1.1240	0.2615
RWPER	-0.000000019	0.000000020	-0.7810	0.4352
RWRE	0.000000026	0.000000030	0.9570	0.3387
RWTEL	0.000000010	0.000000030	0.3490	0.7271

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties * - Significant at 0.10, ** - Significant at 0.05

Chapter 5

Conclusions

1998 Louisiana Nursery Industry Description

The descriptive analysis of Louisiana nurseries provided insight into marketing and production characteristics of large and small Louisiana nurseries. Small nurseries were established more recently, with an average year of establishment in 1985. Large nurseries were, on average, almost twice as old, with an average year of establishment in 1976. There is a wide disparity between the average sales of large and small nurseries. The average sales for large nurseries were over 20 times the average sales of small nurseries. Large and small nurseries grow a relatively similar mix of plants. However, large nurseries typically grow more broad-leaved evergreen shrubs, evergreen trees and annual bedding plants category. Larger nurseries may grow evergreen trees because they complete the product line and are demanded in the market. Annual and bedding plants are products that mass-merchandisers typically sell. Since mass-merchandisers were expected to prefer to work with large nurseries, it is not surprising that large nurseries grow more annuals. Large growers can produce the large numbers of annuals and bedding plants needed by large retailers. Both large and small nurseries sold most of their products to garden centers, landscapers and re-wholesalers, but large nurseries had less variation in their sales through all five marketing channels. The monthly sales pattern for large and small nurseries was very similar. This is expected since, regardless of which channel large and small nurseries sell to, they face the same climate and end consumer demand for their plants. Both large and small nurseries sell most of their products in-state, but large nurseries are more likely to sell out-of-state.

Changes in Marketing Channel Use Over Time

The proportions of sales through the major market channels were examined from 1988 to 1998. The analysis of the TFMP data suggests that the markets for large and small Louisiana nurseries are very dynamic.

The landscaper channel showed a reduction of use from 1988 to 1998 for both large and small Louisiana nurseries. Small nurseries had a reduction of sales to landscapers from nearly 40% of total sales in 1988 to 17% in 1993. Small nursery sales to landscapers rallied in 1998, increasing to almost 27%. Large nurseries had a reduction in sales to landscapers from almost 38% of total sales in 1988 to just over 10% in 1993. Like small nurseries, large Louisiana nurseries had a rise in sales to landscapers to almost 20% of total sales in 1998.

Louisiana nursery sales to retailers had the least amount of change over the ten year period among the three channels. Small nursery sales to retailers went from almost 41% of total sales in 1988 to 49% in 1993. Small nursery sales to retailers then fell to 35% in 1998. Large Louisiana nursery's sales to retailers went from 26% of total sales in 1988 to 30% of total sales in 1993. Large Louisiana nurseries sales to retailers increased slightly to 32% in 1998.

Louisiana nurseries had an increase in the proportion of total sales to re-wholesalers from 1988 to 1998. Small nursery sales to re-wholesalers went from just over 19% of total sales in 1988 to 34% of sales in 1993. Small nursery sales to re-wholesalers continued to increase to

38% of sales in 1998. Large nursery sales to re-wholesalers went from 16% of total sales in 1988 to 58% of sales in 1993. Large Louisiana nursery sales fell to 48% of total sales in 1998.

Large Louisiana nurseries saw a significant increase in the proportion of sales to both retailers and re-wholesalers at the expense of the landscaper channel for the 1988 to 1993 interval. During the 1993 to 1998 interval, the landscaper channel rebounded, with a significant increase in the proportion of large nursery sales to landscapers. However, an examination of the 1988 to 1998 interval reveals that, over the decade, the proportion marketed to retailers and re-wholesalers increased significantly, while the proportion marketed to landscapers dropped. This analysis shows that large and small Louisiana nurseries have increased the proportion of sales to re-wholesalers and retailers at the expense of sales to landscapers.

While the Louisiana nursery market has seen a significant amount of change from 1988 to 1998, analysis of the Gulf States TFMP data reveals a much more static nursery market. Only small nursery sales to retailers from 1988 versus 1998 showed a significant increase in marketing proportion.

Why is the Louisiana nursery market more dynamic than markets in surrounding states? One of the key factors affecting the Louisiana and Texas economies is the oil and gas industry. The oil and gas industry slowed around 1993 (BEA, 2000). Purchases of luxury goods and services, such as landscaping and retail purchases of nursery plants, may have dwindled. Louisiana nurseries still had plants and products that they needed to sell and turned to re-wholesalers to fill this need. As the economy recovered, nursery producers maintained their relationships with re-wholesalers. This may be because re-wholesalers provide Louisiana nurseries with a way to externalize marketing functions. Rather than maintain a sales staff, many small to medium sized nurseries may increase their sales to re-wholesalers to concentrate on what they know best, growing. Selling to re-wholesalers may not be the most profitable option, but it may offer nurseries an indirect way to get their products to other channels and provide insulation from downturns.

The analysis of marketing channel use showed a possible change in the core marketing channels. In 1988, small and large Louisiana nurseries only sold 19 and 16 percent, respectively through the re-wholesaler channel. By 1998, sales to re-wholesalers by small nurseries reached 38% of total sales, while large nurseries sold 47 % of their total sales to re-wholesalers. Re-wholesalers gain in market share came at the expense of both retailers and landscapers. Unfortunately, the combination of all three retail channels into one group does not allow for analysis of how each retail channel has changed over time. However, it appears that the re-wholesaler channel has joined the garden center and landscaper channel as a core marketing channel for Louisiana nurseries.

Marketing Characteristics

Data from the TFMP survey was analyzed to determine which business characteristics help explain nursery grower's marketing strategies. The overall economy in 1998 was very strong. Although crude oil prices were low, both the national and regional economies were growing at a rapid rate.

The models attempted to discern and measure the impact of marketing and production characteristics on marketing decisions and strategies. However, many, if not most of the characteristics that impact marketing decisions are not measured at the farm level. Poor variable significance and goodness of fit in the models may indicate that producers don't make marketing

decisions. Retailers may dictate nursery marketing decisions. Like other agricultural markets, the nursery market has seen a consolidation at the retailer/middleman level. This consolidation has shifted market power to the retailer. The TFMP survey did not collect any information from retailers or middlemen.

Models

Mass-merchandisers

The mass-merchandiser equations in the models performed as expected. Small Louisiana and Gulf States nurseries did not have any significant variables in these equations. Small nurseries were not expected to be customers of mass-merchandisers, so this lack of significance was expected. Large Louisiana and Gulf States nurseries both had the same significant variables with the same coefficient signs. Contract sales had a positive impact on sales to mass merchandisers for both large nursery equations. It was expected that mass-merchandisers would promote and encourage the use of contract production to maintain specific inventory levels. Sales to four or more channels also had a significant and positive effect on sales to mass merchandisers for both the large nursery equations. This was an expected result since mass merchandisers are expected to be a growth channel. Large nurseries are expected to pursue a diversified marketing strategy, using as many channels as they can.

Garden Centers

The garden center equation of the models provided a mix of expected and unexpected results. Garden centers are believed to be a core marketing channel for nurseries. However, neither of the Gulf States garden center equations showed much variable significance. It is unusual that there were so few significant variables for a marketing channel that gets such a large percentage of total sales. The small Louisiana nursery equation for garden centers provided many expected results. Contract sales had a negative impact on sales to garden centers. Garden centers were not expected to engage in contract production. In-state sales had a positive impact on sales to garden centers. This was expected since garden centers are expected to be local customers for most nurseries. Sales to repeat customers had a positive impact on sales to garden centers. It was expected that garden centers and nurseries would develop close relationships. The unexpected results for small Louisiana nursery sales to garden centers came in the transaction method variables. In-person and telephone sales were both significant, but had signs that were opposite of their expectations. It was expected that in-person sales would have a negative impact on sales to garden centers. In-person sales were associated with sales calls and growth opportunities. As a core marketing channel, garden centers were expected to offer limited growth opportunities. Telephone sales were expected to have a positive impact on garden center sales, since it was believed that the relationship between growers and garden centers was more developed and could use a more familiar form of communication. These unexpected results may be a result of ambiguity in the survey question, incorrect expectations of the results or both. The large Louisiana and Gulf States nursery equations for garden centers showed a negative impact for contract production.

The large Louisiana garden center equation also indicated a positive impact for in-state sales. However, large Louisiana nursery computerization had a positive impact on sales to

garden centers. It was expected that computerization would have a negative impact on the core channels and a positive impact on the growth channels. All four equations had significant intercept values. The analysis of the garden center channel indicates that most nurseries do business with in-state garden centers and that increased levels of contract production have a negative impact on the proportion of sales to garden centers.

Other Retailers

The other retailers equations for the four models did not provide much in terms of significant results. Since this was a catch-all category, there were not many expectations about variable coefficients and the direction of their signs. It was expected that the other retailer channel was becoming less attractive. The intercept for the small Louisiana nursery other retailer equation was significant. The large Louisiana nursery equation showed that contract sales had a significant and positive impact on sales to other retailers. The small Gulf States equation indicated that in-state sales had a positive impact on sales to other retailers. The small Gulf States equation also showed that both transaction methods had a negative impact on sales to other retailers. When the use of the two primary transaction methods increased, sales to other retailers decreased. This could indicate that the other retailer channel is becoming less attractive to nurseries. The large Gulf States equation for other retailers did not have any significant variables.

Landscapers

Like the garden center equations, the landscaper equations produced some unexpected results. As a core channel, it was expected that the landscaper equations would provide significant results for each of the 4 models. However, only the Gulf States equations showed a large number of significant variables. The intercept variable was significant for all four equations. In the small Louisiana nursery equation, age had a negative impact on sales to landscapers. This was expected, since older nurseries are expected to diversify away from the core channels. Both Gulf States equations showed that advertising had a positive impact on sales to landscapers while contract sales had a negative impact. Advertising was expected to have a negative impact on the core channels, as it was believed that increased advertising would increase sales to the growth channels. The large Gulf State nursery landscaper equation had negative parameter estimates for sales to four or more channels and sales to repeat customers and a positive parameter estimate for in-state sales. It was expected that the use of four or more channels would have a negative impact on sales to landscapers. Sales to four or more channels should indicate a more diversified marketing strategy and a move away from the core marketing channels. However, the negative sign for sales to repeat customers was unexpected. It was expected that sales to repeat customers would have a positive impact on landscapers. As expected, in-state sales had a positive impact on sales to landscapers.

Re-wholesalers

Like the comparisons of changes in marketing channel use indicated, Louisiana nurseries did a significant amount of business with re-wholesalers. The intercept variable was significant for all four Louisiana and Gulf States re-wholesaler equations. Both Louisiana nursery equations

indicated that in-state sales had a negative impact on sales to re-wholesalers. This was expected since it was believed that most re-wholesalers were located outside Louisiana. The results seem to indicate that the re-wholesaler channel is a growth channel for smaller nurseries, but a core channel for larger nurseries. Both the small Louisiana and Gulf State re-wholesaler equations showed a positive impact for sales to four or more channels. This shows that as small nurseries try to grow and diversify their marketing mix, they used re-wholesalers to achieve this growth. Additionally, small Louisiana nurseries showed that both transaction methods had a positive impact on sales to re-wholesalers. Sales to four or more channels had a negative impact on large nurseries' sales to re-wholesalers. As large nurseries diversify, their growth into other marketing channels may come at the expense of sales to re-wholesalers. Or, as nurseries grow in size, they may develop enough market power to avoid the price-sensitive re-wholesaler channel. The large Louisiana equation showed that the use of three or more computer functions had a negative impact on sales to re-wholesalers. Increasing levels of computerization were expected to indicate that a nursery is increasing production and marketing controls in an attempt to diversify its marketing mix. However, the negative sign may have indicated that the diversification gained by computerization came at the expense of large nursery sales to re-wholesalers.

Variables

The acres variable, although believed to be an important indicator of marketing channel use, was not significant in any of the models. The advertising variable was only significant for small and large Gulf State nursery sales to landscapers. It was expected that this variable would have a negative impact on landscapers, but this variable had a positive impact on sales to landscapers. The age variable followed expectations. It was expected that age would have a negative impact on sales to core channels and a positive impact on the growth channels. The age variable showed a negative impact on small Louisiana nursery sales to landscapers and a positive impact large Louisiana and large Gulf States nursery sales to re-wholesalers.

Computerization was expected to have a positive impact on the growth channels and a negative impact on the core channels. However, the results of this variable showed exactly the opposite. The large Louisiana nursery model showed computerization had a positive impact on sales to garden centers and a negative impact on sales to re-wholesalers. However, analysis of the re-wholesaler channel indicated that the re-wholesaler channel may be a core channel for large nurseries.

The contract sales variable was significant in many of the model equations. The variable followed expectations, with growth channels having positive coefficient and core channels having a negative coefficient.

The sales to four or more channels dummy variable was also significant in many of the model equations. This variable tended to be significant more often for the large nursery models. Larger nurseries should have a more diversified marketing mix, selling to more channels than smaller nurseries, so these results make sense. The sales to four or more channels variable also tended to follow expectations, with growth channel equations having a positive parameter estimate and core channels having a negative parameter estimate. The negative parameter estimates for large nursery sales to re-wholesalers were not expected and helped contribute to the belief that the re-wholesaler channel is a growth channel for small nurseries and a core channel for larger nurseries.

The in-state sales variable followed with expectations. This variable was positive for marketing channels that were expected to be local, such as landscapers and garden centers, and negative for channels that were expected to be out-of-state, such as re-wholesalers.

The transaction method variables, telephone and in-person sales, had several unexpected results. It was expected that these two variables would have opposite signs, but this often wasn't the case. Two equations in the small Louisiana nursery model had instances where the signs of the two transaction method variables were the same. The garden center equation had negative signs for both transaction method variables while the re-wholesaler equation had positive signs for the transaction method variables. The small Gulf States nursery model also had an instance where both transaction method variables shared a negative sign in the other retailer equation. In cases where both transaction method variables were significant in the same equation, telephone sales always had a larger impact, positive or negative, on the equation.

Some of the variables used to explain nursery marketing decisions, although intuitively and theoretically important, probably should have been dropped from the final model. Age, acres and advertising, were all thought to be important characteristics in determining a nursery's marketing mix. However, these variables provided little, if any, insight into marketing decisions. Other variables, such as sales to four or more channels and contract sales, provided a relatively large number of significant results. Unexpectedly, these variables ended up telling a significant portion of the story of grower marketing decisions.

Future Research

Expansion of the data sets would provide a more accurate picture of the nursery industry. Modeling an expanded data set that included all states that had participated in the three TFMP surveys should provide a better view of how, or if, marketing channel use among nurseries is changing. Also, a larger data set would allow for the individual sales categories to be examined. Results from individual sales categories would provide a more specific explanation of how the nursery market is changing for different sized nurseries. Expanding the data set used to explain the proportion of sales through the available marketing channels should improve the results of the model. These results could provide a more informative explanation of how increasing sales allow a nursery more control over its marketing strategies.

Future research in this topic would benefit from a more accurate and detailed database of information. Cooperation by the S-103 Research Committee to coordinate the TFMP survey with the Census of Horticultural Specialties would both increase the amount of data available and the quality of that data. Also, the ability to track how a particular nursery has changed over time would be invaluable. While anonymity is a priority, the capability to determine which marketing characteristics are typical of successful nurseries would benefit both researchers and nurseries.

Limitations

A reason for the dynamic nature of the Louisiana nursery market may be the sample size used to estimate the changes in proportions over time. The 1988 and 1993 surveys had a relatively small number of observations while the 1998 survey had a large number of observations. The 1988 and 1993 surveys may not have captured an accurate representation of the Louisiana nursery industry.

The analysis of how marketing channel use over time has changed was also limited by the scope of the 1988 survey. Because the 1988 survey only collected data for nursery sales to landscapers, re-wholesalers and an aggregated retail channel, it was not possible to track how all five marketing channels have changed over time.

Many of the limitations are a result of the TFMP survey. It would be helpful if future editions of the TFMP survey specified what in-person sales were. Are they sales calls to channels from nursery sales representatives or are they instances where a landscaper is stopping by to pick some plants on his/her way to or from a job site? Uncertainty about grower's survey responses to the proportion of in-person sales question made it difficult to draw conclusions about this transaction method. For many TFMP questions, producers are asked to provide their answers as a proportion of total sales. The precision of these estimates was limited by the information available to the nursery producer when he or she was filling out the TFMP Survey. If a nursery did not have controls in place to efficiently manage the business, the answers to the survey may be limited to the producer's best 'guesstimate'.

It is difficult to compare sales-weighted variables between large and small nursery models. If both a large and small nursery equation have the same variable that is significant for a given equation, the small nursery variable will usually have a larger magnitude. However, this is offset by the larger overall sales of the large nursery model observations. If the sample size was large enough to create models for each sales category, it would not be necessary to use sales-weighted variables. This would allow for more analysis and comparison between nurseries of different size.

Many of the differences in the Louisiana and Gulf States models may be attributed to the way the data was collected. The data collection effort for the Gulf States was designed to capture a large proportion of the states total nursery sales, while the Louisiana data collection effort attempted to obtain a response from every grower in the state. As a result, the Louisiana data set has a larger number of smaller nurseries in the data set. This may explain why many of the Gulf States small nursery equations have so few significant variables.

Much of the information that influences grower marketing decisions is not available at the farm/producer level. It would be helpful to poll or survey middlemen and retailers about their marketing and purchasing practices to better understand the nursery market. While much of this information is considered proprietary, it would be a helpful tool in understanding how the market for nursery products functions.

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Appendices

Appendix A: 1998 Trade Flows and Marketing Practices Survey

THIRD NATIONAL SURVEY

GENERAL INFORMATION

From what state are you reporting?

In what year was your firm established?

Does your business operate a nursery in another state? ____ yes ____ no

If yes, please list the state(s)

3. How many people does your firm employ at this location?

Permanent employees

Temporary employees _____ (average number during your peak season)

1. What functions of your firm are computerized?

Function	Using computer for task now	Planned within next five years
	(please check if yes)	
Word processing	_____	_____
Accounting	_____	_____
Inventory	_____	_____
Financial investments	_____	_____
Marketing – Web page (Internet)	_____	_____
- CDs	_____	_____
Communications - E-mail	_____	_____
- faxing	_____	_____
Landscape designing	_____	_____
Production scheduling	_____	_____
Greenhouse production controls	_____	_____
Other (please specify)	_____	_____

PRODUCTS

2. What percentage of your sales are in these plant categories?

_____ % Deciduous shade and flowering trees
_____ % Deciduous shrubs
_____ % Broad-leaved evergreen shrubs
_____ % Narrow-leaved evergreen shrubs
_____ % Evergreen trees
_____ % Azaleas
_____ % Vines and grounds covers
_____ % Roses
_____ % Herbaceous perennials
_____ % Bedding plants - annuals
_____ % Bedding plants - vegetables, fruits, and herbs
_____ % Flowering potted plants
_____ % Christmas trees (live or cut)
_____ % Tree fruits
_____ % Foliage
_____ % Propagated material (liners, cuttings, plugs, etc.)
_____ % Other
100 % Total

3. Considering your landscape/floriculture production area, what acreage (or square feet) is devoted to the following:

Propagation:

_____ Acres in open field

In ground field production:

_____ Acres in open field

_____ Square feet (or acres) in shade - for landscape plants

Container production:

_____ Acres in open container production

_____ Square feet (or acres) in greenhouse or shade

_____ For landscape plants

_____ For floriculture crops

4. Considering all plants sold by your firm, what percentage of your sales are in these forms?

Percent of Sales

Method Used

_____ % Bare root
_____ % Balled and potted
_____ % Balled and burlapped
_____ % Processed balled
_____ % Container
_____ % Field grow bag
_____ % In-ground containers (pot-in-pot)
_____ % Other (please specify)
100 % Total

SALES CONSIDERATIONS

5. At how many trade shows was your firm represented in 1998?

_____ With an exhibit
 _____ Without an exhibit

6. What percentage of your sales are done with repeat customers? _____ %

7. Do you publish discount (price) information for large-volume purchases? ____ yes ____ no

8. What percentage of your sales transactions are made using the following methods? (Note: negotiated means there was some discussion/debate over price, quality or other terms of sale.)

Percent	Method
_____ %	Trade show orders (negotiated)
_____ %	Trade show orders (nonnegotiated)
_____ %	Telephone orders (negotiated)
_____ %	Telephone orders (nonnegotiated)
_____ %	In-person orders (negotiated)
_____ %	In-person orders (nonnegotiated)
_____ %	Mail orders
100 %	Total sales

9. Please rate each of the factors listed below according to how much they impact your business. Use a 1 to 5 scale, with 1=very minor; 2=minor; 3=neutral; 4=important; 5=very important.

	1	2	3	4	5
Weather uncertainty					
Land					
Market demand					
Labor					
Water supply					
Capital					
Own managerial expertise					
Competition					
Environmental regulations					
Other government regulations					
Ability to hire competent management					
Ability to hire competent hourly employees					

PRODUCT FLOW

13. What are the top five states, including your own state, from which you purchase seedlings, liners, whips, or grafted material?

	Percent of Purchases
Top five states:	
1) Home state	_____ %
2)	_____ %
3)	_____ %
4)	_____ %
5)	_____ %
All other states combined	_____ %
Total =	100 %

14. What percentage of your firm's total annual sales occur during each month?

_____ % January	_____ % May	_____ % September
_____ % February	_____ % June	_____ % October
_____ % March	_____ % July	_____ % November
_____ % April	_____ % August	_____ % December

15. Do you **export** nursery products out of the U.S.? _____ yes _____ no
If yes, what percentage of total sales are from **exports**? _____ %
Do you **import** nursery products? _____ yes _____ no
If yes, indicate country(ies) of origin:

16. What percent of your firm's total annual sales are:
_____ % In-state (your home state)
_____ % **Out-of-state** (outside of your home state)
100 % Total

If you sell any product **out-of-state**, what are the **top five destinations** by state and the share of your total out-of-state sales?

	Distribution of Total Out-of state Sales
Top five states:	
1)	_____ %
2)	_____ %
3)	_____ %
4)	_____ %
5)	_____ %
All other out-of-state sales combined	_____ %
Total =	100 %

17. Do you handle/resell items from other growers? _____ yes _____ no

If yes, what percent of your total sales does this account for? _____ %

18. What percentage of your total sales are on contract, in other words, sold or committed before being planted/potted? _____ %

What type of buyer(s) are contracting with your firm?

_____ Other producers _____ Retail garden centers

_____ Mass merchandisers _____ Cooperatives

_____ Other (please specify)

19. What percent of your **total annual sales** are:

_____ % Wholesale

_____ % Retail

100 % Total

20. If you sell wholesale, what percentage of your **wholesale sales** (from question 19) are to:

_____ % Retail firms - mass merchandisers/home centers

_____ % Retail firms - garden centers

_____ % Retail firms - other (grocery, hardware, etc.)

_____ % Landscape firms (in-house or external)

_____ % Re-wholesalers (brokers, other growers, etc.)

100 % Total

21. For dollar sales to **mass merchandisers/home centers (from question 20)**, what are the top destination states and what percentage of sales to **mass merchandisers** does each state represent? Please begin with your own state first.

Percent of Total Sales

Top five states:

1) Home state _____ %

2) _____ %

3) _____ %

4) _____ %

5) _____ %

All other states combined _____ %

Total = 100 %

22. For dollar sales to **garden centers (from question 20)**, what are the top five destination states and what percentage of **garden centers** sales does each state represent? Please begin with your own state first.

	Percent of Total Sales
Top five states:	
1) <u>Home state</u>	_____ %
2)	_____ %
3)	_____ %
4)	_____ %
5)	_____ %
All other states combined	_____ %
Total =	100 %

23. For dollar sales to **other retail stores (from question 20)**, what are the top five destination states and what percentage of sales to **other retail firms** does each state represent? Please begin with your own state first.

	Percent of Total Sales
Top five states:	
1) <u>Home state</u>	_____ %
2)	_____ %
3)	_____ %
4)	_____ %
5)	_____ %
All other states combined	_____ %
Total =	100 %

24. For dollar sales to **landscapers (from question 20)**, what are the top five destination states and what percentage of sales to **landscapers** does each state represent? Please begin with your own state first.

	Percent of Total Sales
Top five states:	
1) <u>Home state</u>	_____ %
2)	_____ %
3)	_____ %
4)	_____ %
5)	_____ %
All other states combined	_____ %
Total =	100 %

25. For dollar sales to **re-wholesalers (from question 20)**, what are the top five destination states and what percentage of re-wholesaler sales does each state represent? Please begin with your own state first.

	Percent of Total Sales
Top five states:	
1) <u>Home state</u>	_____ %
2)	_____ %
3)	_____ %
4)	_____ %
5)	_____ %
All other states combined	_____ %
Total =	100 %

PRICE DETERMINATION

26. Regarding price determination, please rate the level of importance of each factor by using the 1 to 5 scale, with 1=very minor; 2=minor; 3=neutral; 4=important; 5=very important.

	1	2	3	4	5
Cost of production					
Inflation					
Other growers' prices					
Grade of plants					
Market demand					
Product uniqueness					
Inventory levels					
Last year's price					
Other (please specify)					

27. Regarding factors that might limit the expansion of the geographic scope of your trading area, please rate the level of importance of each factor by using the 1 to 5 scale, with 1=very minor; 2=minor; 3=neutral; 4=important; 5=very important.

	1	2	3	4	5
Capital					
Marketing					
Personnel					
Production					
Transportation					
Plant offering					

ADVERTISING

28. What percentage of sales did you allocate in 1998 to advertising? _____ %

How do you allocate these advertising dollars?

_____ % Web sites

_____ % Yellow pages

_____ % Radio

_____ % Billboards

_____ % Catalogs (print or CD)

_____ % Trade journals

_____ % Newsletters

_____ % Trade shows

_____ % Other, please specify _____ 100 % Total

SALES

29. What was the gross value of product sales from your nursery in 1998, or your most recently completed fiscal year? Please check the appropriate category.

_____ Less than \$50,000

_____ \$ 50,000 - \$ 99,999

_____ \$ 100,000 - \$ 249,999

_____ \$ 250,000 - \$ 499,999

_____ \$ 500,000 - \$ 999,999

_____ \$ 1,000,000 - \$ 1,999,999

_____ \$ 2,000,000 - \$ 2,999,999

_____ \$ 3,000,000 - \$ 3,999,999

_____ \$ 4,000,000 - \$ 4,999,999

_____ \$ 5,000,000 - \$ 9,999,999

_____ \$10,000,000 or above

Appendix B: Changes in Market Channel Use Model

```
DATA NEW;  
infile 'c:\My Documents\Thesis\SAS Programs\Data Sets\9398CH1.TXT';  
INPUT RS S Y CH YEAR;
```

```
PROC anova data=new (where=(S<200000));  
classes year;  
model y = year;  
means year/hovtest=levene welch;
```

```
PROC anova data=new (where=(S>200000));  
classes year;  
model y = year;  
means year/hovtest=levene welch;
```

```
run;
```

Appendix C: Marketing Channel Choice Model

```
DATA LA;
infile 'c:\My Documents\Thesis\SAS Programs\Data Sets\LA99NEW.TXT' missover lrecl=80
pad;
INPUT
Q 1-3 Q1 $4-5 Q2 6-9 Q2A 10 Q2B1 $11-12 Q2B2 $13-14 Q2B3 $15-16 Q3A 17-19 Q3B 20-
22
Q4A1 23 Q4A2 24 Q4B1 25 Q4B2 26 Q4C1 27 Q4C2 28 Q4D1 29 Q4D2 30 Q4E1 31 Q4E2 32
Q4F1 33 Q4F2 34 Q4G1 35 Q4G2 36 Q4H1 37 Q4H2 38 Q4I1 39 Q4I2 40 Q4J1 41 Q4J2 42
Q4K1 43 Q4K2 44 Q4L $45-68 Q4L1 69 Q4L2 70 /
Q4M $1-24 Q4M1 25 Q4M2 26 Q5A 27-29 Q5B 30-32 Q5C 33-35 Q5D 36-38 Q5E 39-41 Q5F
42-44
Q5G 45-47 Q5H 48-50 Q5I 51-53 Q5J 54-56 Q5K 57-59 Q5L 60-62 Q5M 63-65 Q5N 66-68
Q5O 69-71 Q5P 72-74 Q5Q 75-77 /
Q5Q1 $1-25 Q6A 26-31 Q6B1 32-37 Q6B2 38-43 Q6C1 44-49 Q6C2 50-55 Q6D1 56-61 Q6D2
62-67
Q6E1 68-73 Q6E2 74-79 /
Q6F 1-6 Q6G1 7-12 Q6G2 13-18 Q6H1 19-24 Q6H2 25-30 Q7A 31-33 Q7B 34-36 Q7C 37-39
Q7D 40-42
Q7E 43-45 Q7F 46-48 Q7G 49-51 Q7H 52-54 /
Q7H1 $1-28 Q7I 29-31 Q7I1 $32-59 Q8A 60-61 Q8B 62-63 Q9 64-66 Q10 67 Q11A 68-70
Q11B 71-73 Q11C 74-76 Q11D 77-79 /
Q11E 1-3 Q11F 4-6 Q11G 7-9 Q12A 10 Q12B 11 Q12C 12 Q12D 13 Q12E 14 Q12F 15 Q12G
16 Q12H 17
Q12I 18 Q12J 19 Q12K 20 Q12L 21 Q13A1 $22-23 Q13A2 24-26 Q13B1 $27-28 Q13B2 29-31
Q13C1 $32-33 Q13C2 34-36 Q13D1 $37-38 Q13D2 39-41 Q13E1 $42-43 Q13E2 44-46 Q13F2
47-49
Q14A 50-52 Q14E 53-55 Q14I 56-58 Q14B 59-61 Q14F 62-64 Q14J 65-67 Q14C 68-70 Q14G
71-73
Q14K 74-76 Q14D 77-79 /
Q14H 1-3 Q14L 4-6 Q15A 7 Q15B 8-10 Q15C 11 Q15D1 $12-26 Q15D2 $27-41 Q15D3 $42-
56
Q16Ax 57-59 Q16Ay $60-61 Q16Az 62-64 Q16A1 $65-66 Q16A2 67-69 Q16B1 $70-71
Q16B2 72-74
Q16C1 $75-76 Q16C2 77-79 /
Q16D1 $1-2 Q16D2 3-5 Q16E1 $6-7 Q16E2 8-10 Q16F2 11-13 Q17A 14 Q17B 15-17 Q18 18-
20
Q18A 21 Q18B 22 Q18C 23 Q18D 24 Q18E 25 Q18E1 $26-51 Q19A 52-54 Q19B 55-57 Q20A
58-60
Q20B 61-63 Q20C 64-66 Q20D 67-69 Q20E 70-72 Q21A1 $73-74 Q21A2 75-77 Q21B1 $78-
79 /
Q21B2 1-3 Q21C1 $4-5 Q21C2 6-8 Q21D1 $9-10 Q21D2 11-13 Q21E1 $14-15 Q21E2 16-18
Q21F2 19-21 Q22A1 $22-23 Q22A2 24-26 Q22B1 $27-28 Q22B2 29-31 Q22C1 $32-33 Q22C2
34-36
```

Q22D1 \$37-38 Q22D2 39-41 Q22E1 \$42-43 Q22E2 44-46 Q22F2 47-49 Q23A1 \$50-51 Q23A2
 52-54
 Q23B1 \$55-56 Q23B2 57-59 Q23C1 \$60-61 Q23C2 62-64 Q23D1 \$65-66 Q23D2 67-69
 Q23E1 \$70-71 Q23E2 72-74 Q23F2 75-77 Q24A1 \$78-79 /
 Q24A2 1-3 Q24B1 \$4-5 Q24B2 6-8 Q24C1 \$9-10 Q24C2 11-13 Q24D1 \$14-15 Q24D2 16-18
 Q24E1 \$19-20
 Q24E2 21-23 Q24F2 24-26 Q25A1 \$27-28 Q25A2 29-31 Q25B1 \$32-33 Q25B2 34-36 Q25C1
 \$37-38
 Q25C2 39-41 Q25D1 \$42-43 Q25D2 44-46 Q25E1 \$47-48 Q25E2 49-51 Q25F2 52-54 Q26A
 55
 Q26B 56 Q26C 57 Q26D 58 Q26E 59 Q26F 60 Q26G 61 Q26H 62 Q26I 63 /
 Q26I1 \$1-25 Q27A 26 Q27B 27 Q27C 28 Q27D 29 Q27E 30 Q27F 31 Q28 32-34 Q28A 35-37
 Q28B 38-40
 Q28C 41-43 Q28D 44-46 Q28E 47-49 Q28F 50-52 Q28G 53-55 Q28H 56-58 Q28I 59-61 /
 Q28I1 \$1-29 Q29 30-31 Buffer \$32-41;

* ADJUSTMENT FOR TOTAL SALES *****;

IF Q29=0 THEN Q29=0;
 IF Q29=1 THEN Q29=25000;
 IF Q29=2 THEN Q29=75000;
 IF Q29=3 THEN Q29=175000;
 IF Q29=4 THEN Q29=375000;
 IF Q29=5 THEN Q29=750000;
 IF Q29=6 THEN Q29=1500000;
 IF Q29=7 THEN Q29=2500000;
 IF Q29=8 THEN Q29=3500000;
 IF Q29=9 THEN Q29=4500000;
 IF Q29=10 THEN Q29=7500000;
 IF Q29=11 THEN Q29=12500000;
 IF Q29=12 THEN Q29=0;

* CHANGING MISSING VALUES TO ZEROS *****;

if Q3a=. then Q3a=0;
 if Q3b=. then Q3b=0;
 if Q4a1=. then Q4a1=0;
 if Q4b1=. then Q4b1=0;
 if Q4c1=. then Q4c1=0;
 if Q4d1=. then Q4d1=0;
 if Q4e1=. then Q4e1=0;
 if Q4f1=. then Q4f1=0;
 if Q4g1=. then Q4g1=0;
 if Q4h1=. then Q4h1=0;
 if Q4i1=. then Q4i1=0;

```

if Q4j1=. then Q4j1=0;
if Q4k1=. then Q4k1=0;
if Q4l1=. then Q4l1=0;
if Q5a=. then Q5a=0;
if Q5b=. then Q5b=0;
if Q5c=. then Q5c=0;
if Q5d=. then Q5d=0;
if Q5e=. then Q5e=0;
if Q5f=. then Q5f=0;
if Q5g=. then Q5g=0;
if Q6f=. then Q6f=0;
if Q6g1=. then Q6g1=0;
if Q6g2=. then Q6g2=0;
if Q8a=. then Q8a=0;
if Q11d=. then Q11d=0;
if Q11e=. then Q11e=0;
if Q11c=. then Q11c=0;
if Q11f=. then Q11f=0;
if Q12a=. then Q12a=0;
if q12f=. then q12f=1;
if q12k=. then q12k=1;
if q12l=. then q12l=1;
if Q16ax=. then Q16ax=0;
if Q18=. then q18=0;
if Q20a=. then Q20a=0;
if Q20b=. then Q20b=0;
if Q20c=. then Q20c=0;
if Q20d=. then Q20d=0;
if Q20e=. then Q20e=0;
if Q26d=. then q26d=1;
if q26f=. then q26f=1;
if q26g=. then q26g=1;
if Q28=. then Q28=0;

```

* CALUCULATED VARIABLES *****;

```

DIVERSE = SUM(Q5a,Q5b,Q5c,Q5d,Q5e,Q5f,Q5g);
Q5HORT = SUM(Q5H,Q5I,Q5J,Q5K,Q5L,Q5M,Q5N,Q5O);
If Q2 ne . then AGE=1999-Q2;
ACRES=Q6F+Q6G1+(Q6G2/43560);
EMPLOY=Q3A+Q3B;
COMP=Q4A1+Q4B1+Q4C1+Q4D1+Q4E1+Q4G1+Q4H1+Q4I1+Q4J1+Q4K1+Q4L1;
SALES=Q29;

```

* SALES-WEIGHTED VARIABLES *****;

```

TEL=(Q11C+Q11D)*Q29;

```



```

PER=(Q11E+Q11F)*Q29;
IN=(Q16AX)*Q29;
CON=(Q18)*Q29;
AD=(Q28)*Q29;
*WO=DIVERSE*Q29*****;
RE=Q9*Q29;

```

```

* CREATING DUMMY VARIABLES *****;
if q26d ne . then DUM1=(q26d>4);
if q26f ne . then DUM2=(q26f>4);
if q12f ne . then DUM3=(q12g>4);
if q12k ne . then DUM4=(q12k>4);
if q12l ne . then DUM5=(q12l>4);
if DIVERSE ne . then DUM6=(DIVERSE<75);
if COMP ne . then COMPU=(comp>2);
if q20a ne . then DUMa=(q20a>0);
if q20b ne . then DUMb=(q20b>0);
if q20c ne . then DUMc=(q20c>0);
if q20d ne . then DUMd=(q20d>0);
if q20e ne . then DUMe=(q20e>0);
GT3CH=((DUMa+DUMb+DUMc+DUMd+DUMe)>3);

```

```

* MODEL-changed structure to large and small *****;
%let regvars= SALES AGE TEL PER IN CON AD ACRES RE COMPU GT3CH;

```

```

* CHANGING DATA SET TO ALL WOODY ORNAMENTALS AND FLORICULTURE
*****;

```

```

data one;
set la;
allmiss=0;
if sum(of q20a--q20e) ne 100 then allmiss=1;
array q20{5} q20a--q20e;
do i=1 to 5;
  if ~allmiss then y=q20{i};
  else y=.;
  d1=(i=1);
  d2=(i=2);
  d3=(i=3);
  d4=(i=4);
  d5=(i=5);
output;
end;
drop i allmiss q20a--q20e;
run;

```

```

data laout;
set one;
drop q1--q29;
array regvar &regvars;
array d1regvar d1SALES d1AGE d1TEL d1PER d1IN d1CON d1AD
d1ACRES d1RE d1COMPU d1GT3CH;
array d2regvar d2SALES d2AGE d2TEL d2PER d2IN d2CON d2AD
d2ACRES d2RE d2COMPU d2GT3CH;
array d3regvar d3SALES d3AGE d3TEL d3PER d3IN d3CON d3AD
d3ACRES d3RE d3COMPU d3GT3CH;
array d4regvar d4SALES d4AGE d4TEL d4PER d4IN d4CON d4AD
d4ACRES d4RE d4COMPU d4GT3CH;
array d5regvar d5SALES d5AGE d5TEL d5PER d5IN d5CON d5AD
d5ACRES d5RE d5COMPU d5GT3CH;

```

```

do over d1regvar;
  d1regvar=d1*regvar;
end;
do over d2regvar;
  d2regvar=d2*regvar;
end;
do over d3regvar;
  d3regvar=d3*regvar;
end;
do over d4regvar;
  d4regvar=d4*regvar;
end;
do over d5regvar;
  d5regvar=d5*regvar;
end;
run;

```

```

proc reg data=laout (where=(SALES<200000));
model y=      d1 d2 d3 d4 d5
              d1TEL d2TEL d3TEL d4TEL d5TEL
              d1PER d2PER d3PER d4PER d5PER
              d1IN d2IN d3IN d4IN d5IN
              d1CON d2CON d3CON d4CON d5CON
              d1AD d2AD d3AD d4AD d5AD
              d1ACRES d2ACRES d3ACRES d4ACRES d5ACRES
              d1RE d2RE d3RE d4RE d5RE
              d1AGE d2AGE d3AGE d4AGE d5AGE
              d1COMPU d2COMPU d3COMPU d4COMPU d5COMPU

```

```

d1GT3CH d2GT3CH d3GT3CH d4GT3CH d5GT3CH/noint;

proc reg data=laout (where=(SALES>200000));
model y=      d1 d2 d3 d4 d5
             d1TEL d2TEL d3TEL d4TEL d5TEL
             d1PER d2PER d3PER d4PER d5PER
             d1IN d2IN d3IN d4IN d5IN
             d1CON d2CON d3CON d4CON d5CON
             d1AD d2AD d3AD d4AD d5AD
             d1ACRES d2ACRES d3ACRES d4ACRES d5ACRES
             d1RE d2RE d3RE d4RE d5RE
             d1AGE d2AGE d3AGE d4AGE d5AGE
             d1COMPU d2COMPU d3COMPU d4COMPU d5COMPU
             d1GT3CH d2GT3CH d3GT3CH d4GT3CH d5GT3CH/noint;

proc reg data=laout;
model y=      d1 d2 d3 d4 d5
             d1SALES d2SALES d3SALES d4SALES d5SALES
             d1TEL d2TEL d3TEL d4TEL d5TEL
             d1PER d2PER d3PER d4PER d5PER
             d1IN d2IN d3IN d4IN d5IN
             d1CON d2CON d3CON d4CON d5CON
             d1AD d2AD d3AD d4AD d5AD
             d1ACRES d2ACRES d3ACRES d4ACRES d5ACRES
             d1RE d2RE d3RE d4RE d5RE
             d1AGE d2AGE d3AGE d4AGE d5AGE
             d1COMPU d2COMPU d3COMPU d4COMPU d5COMPU
             d1GT3CH d2GT3CH d3GT3CH d4GT3CH d5GT3CH/noint;

run;

```

Appendix D: Generalized Dependent Variable Models

```
DATA LA;  
infile 'd:\work\thesis\sas data sets\LA99NEW.TXT' missover lrecl=80 pad;  
INPUT
```

```
* ADJUSTMENT FOR TOTAL SALES *****;
```

```
IF Q29=0 THEN Q29=0;  
IF Q29=1 THEN Q29=25000;  
IF Q29=2 THEN Q29=75000;  
IF Q29=3 THEN Q29=175000;  
IF Q29=4 THEN Q29=375000;  
IF Q29=5 THEN Q29=750000;  
IF Q29=6 THEN Q29=1500000;  
IF Q29=7 THEN Q29=2500000;  
IF Q29=8 THEN Q29=3500000;  
IF Q29=9 THEN Q29=4500000;  
IF Q29=10 THEN Q29=7500000;  
IF Q29=11 THEN Q29=12500000;  
IF Q29=12 THEN Q29=0;
```

```
* CHANGING MISSING VALUES TO ZEROS *****;
```

```
if Q3a=. then Q3a=0;  
if Q3b=. then Q3b=0;  
if Q4a1=. then Q4a1=0;  
if Q4b1=. then Q4b1=0;  
if Q4c1=. then Q4c1=0;  
if Q4d1=. then Q4d1=0;  
if Q4e1=. then Q4e1=0;  
if Q4f1=. then Q4f1=0;  
if Q4g1=. then Q4g1=0;  
if Q4h1=. then Q4h1=0;  
if Q4i1=. then Q4i1=0;  
if Q4j1=. then Q4j1=0;  
if Q4k1=. then Q4k1=0;  
if Q4l1=. then Q4l1=0;  
if Q5a=. then Q5a=0;  
if Q5b=. then Q5b=0;  
if Q5c=. then Q5c=0;  
if Q5d=. then Q5d=0;  
if Q5e=. then Q5e=0;  
if Q5f=. then Q5f=0;  
if Q5g=. then Q5g=0;  
if Q6f=. then Q6f=0;
```

```

if Q6g1=. then Q6g1=0;
if Q6g2=. then Q6g2=0;
if Q8a=. then Q8a=0;
if Q11d=. then Q11d=0;
if Q11e=. then Q11e=0;
if Q11c=. then Q11c=0;
if Q11f=. then Q11f=0;
if Q12a=. then Q12a=0;
if q12f=. then q12f=1;
if q12k=. then q12k=1;
if q12l=. then q12l=1;
if Q16ax=. then Q16ax=0;
if Q18=. then q18=0;
if Q20a=. then Q20a=0;
if Q20b=. then Q20b=0;
if Q20c=. then Q20c=0;
if Q20d=. then Q20d=0;
if Q20e=. then Q20e=0;
if Q26d=. then q26d=1;
if q26f=. then q26f=1;
if q26g=. then q26g=1;
if Q28=. then Q28=0;

```

* CALUCULATED VARIABLES *****;

```

DIVERSE = SUM(Q5a,Q5b,Q5c,Q5d,Q5e,Q5f,Q5g);
Q5SHORT = SUM(Q5H,Q5I,Q5J,Q5K,Q5L,Q5M,Q5N,Q5O);
If Q2 ne . then AGE=1999-Q2;
ACRES=Q6F+Q6G1+(Q6G2/43560);
EMPLOY=Q3A+Q3B;
COMP=Q4A1+Q4B1+Q4C1+Q4D1+Q4E1+Q4G1+Q4H1+Q4I1+Q4J1+Q4K1+Q4L1;
SALES=Q29;

```

* SALES-WEIGHTED VARIABLES *****;

```

TEL=(Q11C+Q11D)*Q29;
PER=(Q11E+Q11F)*Q29;
IN=(Q16AX)*Q29;
CON=(Q18)*Q29;
AD=(Q28)*Q29;
*WO=DIVERSE*Q29*****;
RE=Q9*Q29;

```

* CREATING DUMMY VARIABLES *****;

```

if q26d ne . then DUM1=(q26d>4);
if q26f ne . then DUM2=(q26f>4);

```

```

if q12f ne . then DUM3=(q12g>4);
if q12k ne . then DUM4=(q12k>4);
if q12l ne . then DUM5=(q12l>4);
if DIVERSE ne . then DUM6=(DIVERSE<75);
if COMP ne . then COMPU=(comp>2);
if q20a ne . then DUMa=(q20a>0);
if q20b ne . then DUMb=(q20b>0);
if q20c ne . then DUMc=(q20c>0);
if q20d ne . then DUMd=(q20d>0);
if q20e ne . then DUMe=(q20e>0);
GT3CH=((DUMa+DUMb+DUMc+DUMd+DUMe)>3);

if q20a ne . then MMS1=(q20a>50);
if q20b ne . then GCS1=(q20b>50);
if q20c ne . then ORS1=(q20c>50);
if q20d ne . then LDS1=(q20d>50);
if q20e ne . then RWS1=(q20e>50);

if q20a ne . then MMS2=(q20a>33);
if q20b ne . then GCS2=(q20b>33);
if q20c ne . then ORS2=(q20c>33);
if q20d ne . then LDS2=(q20d>33);
if q20e ne . then RWS2=(q20e>33);

if q20a ne . then MMS3=(q20a>0);
if q20b ne . then GCS3=(q20b>0);
if q20c ne . then ORS3=(q20c>0);
if q20d ne . then LDS3=(q20d>0);
if q20e ne . then RWS3=(q20e>0);

* MM Individual equation*****;
proc reg data=la (where=(SALES<200000));
title 'small ind mm sales';
model mms3 = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

* GC Individual equation*****;
proc reg data=la (where=(SALES<200000));
title 'small ind mm sales';
model gcs3 = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

* OR Individual equation*****;
proc reg data=la (where=(SALES<200000));
title 'small ind mm sales';
model ors3 = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

* LD Individual equation*****;

```

```

proc reg data=la (where=(SALES<200000));
title 'small ind mm sales';
model lds3 = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

* RW Individual equation*****;
proc reg data=la (where=(SALES<200000));
title 'small ind mm sales';
model rws3 = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

* MM Individual equation*****;
proc reg data=la (where=(SALES>200000));
title 'small ind mm sales';
model mms3 = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

* GC Individual equation*****;
proc reg data=la (where=(SALES>200000));
title 'small ind mm sales';
model gcs3 = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

* OR Individual equation*****;
proc reg data=la (where=(SALES>200000));
title 'small ind mm sales';
model ors3 = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

* LD Individual equation*****;
proc reg data=la (where=(SALES>200000));
title 'small ind mm sales';
model lds3 = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

* RW Individual equation*****;
proc reg data=la (where=(SALES>200000));
title 'small ind mm sales';
model rws3 = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

run;

```

Appendix E: Model Specification/RESET Test

```
DATA LA;  
infile 'd:\work\thesis\sas data sets\LA99NEW.TXT' missover lrecl=80 pad;  
INPUT
```

```
* ADJUSTMENT FOR TOTAL SALES *****;
```

```
IF Q29=0 THEN Q29=0;  
IF Q29=1 THEN Q29=25000;  
IF Q29=2 THEN Q29=75000;  
IF Q29=3 THEN Q29=175000;  
IF Q29=4 THEN Q29=375000;  
IF Q29=5 THEN Q29=750000;  
IF Q29=6 THEN Q29=1500000;  
IF Q29=7 THEN Q29=2500000;  
IF Q29=8 THEN Q29=3500000;  
IF Q29=9 THEN Q29=4500000;  
IF Q29=10 THEN Q29=7500000;  
IF Q29=11 THEN Q29=12500000;  
IF Q29=12 THEN Q29=0;
```

```
* CHANGING MISSING VALUES TO ZEROS *****;
```

```
if Q3a=. then Q3a=0;  
if Q3b=. then Q3b=0;  
if Q4a1=. then Q4a1=0;  
if Q4b1=. then Q4b1=0;  
if Q4c1=. then Q4c1=0;  
if Q4d1=. then Q4d1=0;  
if Q4e1=. then Q4e1=0;  
if Q4f1=. then Q4f1=0;  
if Q4g1=. then Q4g1=0;  
if Q4h1=. then Q4h1=0;  
if Q4i1=. then Q4i1=0;  
if Q4j1=. then Q4j1=0;  
if Q4k1=. then Q4k1=0;  
if Q4l1=. then Q4l1=0;  
if Q5a=. then Q5a=0;  
if Q5b=. then Q5b=0;  
if Q5c=. then Q5c=0;  
if Q5d=. then Q5d=0;  
if Q5e=. then Q5e=0;  
if Q5f=. then Q5f=0;  
if Q5g=. then Q5g=0;  
if Q6f=. then Q6f=0;  
if Q6g1=. then Q6g1=0;  
if Q6g2=. then Q6g2=0;
```



```

if Q8a=. then Q8a=0;
if Q11d=. then Q11d=0;
if Q11e=. then Q11e=0;
if Q11c=. then Q11c=0;
if Q11f=. then Q11f=0;
if Q12a=. then Q12a=0;
if q12f=. then q12f=1;
if q12k=. then q12k=1;
if q12l=. then q12l=1;
if Q16ax=. then Q16ax=0;
if Q18=. then q18=0;
if Q20a=. then Q20a=0;
if Q20b=. then Q20b=0;
if Q20c=. then Q20c=0;
if Q20d=. then Q20d=0;
if Q20e=. then Q20e=0;
if Q26d=. then q26d=1;
if q26f=. then q26f=1;
if q26g=. then q26g=1;
if Q28=. then Q28=0;

```

* CALUCULATED VARIABLES *****;

```

DIVERSE = SUM(Q5a,Q5b,Q5c,Q5d,Q5e,Q5f,Q5g);
Q5SHORT = SUM(Q5H,Q5I,Q5J,Q5K,Q5L,Q5M,Q5N,Q5O);
If Q2 ne . then AGE=1999-Q2;
ACRES=Q6F+Q6G1+(Q6G2/43560);
EMPLOY=Q3A+Q3B;
COMP=Q4A1+Q4B1+Q4C1+Q4D1+Q4E1+Q4G1+Q4H1+Q4I1+Q4J1+Q4K1+Q4L1;
SALES=Q29;

```

* SALES-WEIGHTED VARIABLES *****;

```

TEL=(Q11C+Q11D)*Q29;
PER=(Q11E+Q11F)*Q29;
IN=(Q16AX)*Q29;
CON=(Q18)*Q29;
AD=(Q28)*Q29;
*WO=DIVERSE*Q29*****;
RE=Q9*Q29;

```

* CREATING DUMMY VARIABLES *****;

```

if q26d ne . then DUM1=(q26d>4);
if q26f ne . then DUM2=(q26f>4);
if q12f ne . then DUM3=(q12g>4);
if q12k ne . then DUM4=(q12k>4);
if q12l ne . then DUM5=(q12l>4);
if DIVERSE ne . then DUM6=(DIVERSE<75);

```

```

if COMP ne . then COMPU=(comp>2);
if q20a ne . then DUMa=(q20a>0);
if q20b ne . then DUMb=(q20b>0);
if q20c ne . then DUMc=(q20c>0);
if q20d ne . then DUMd=(q20d>0);
if q20e ne . then DUMe=(q20e>0);
GT3CH=((DUMa+DUMb+DUMc+DUMd+DUMe)>3);

* MM Individual equation*****;
proc reg data=la (where=(SALES<200000));
title 'small ind mm sales';
model q20a = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

output out=yhat p=yhat;

DATA yhatout;
set yhat;
p2 = yhat*yhat;
p3 = yhat*yhat*yhat;
p4 = yhat*yhat*yhat*yhat;

proc reg data=yhatout (where=(SALES<200000));
title 'small ind mm sales';
model q20a = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH p2 p3 p4;

* MM Individual equation*****;
proc reg data=la (where=(SALES>200000));
title 'large ind mm sales';
model q20a = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

output out=yhat p=yhat;

DATA yhatout;
set yhat;
p2 = yhat*yhat;
p3 = yhat*yhat*yhat;
p4 = yhat*yhat*yhat*yhat;

proc reg data=yhatout (where=(SALES>200000));
title 'large ind mm sales';
model q20a = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH p2 p3 p4;

* GC Individual equation*****;
proc reg data=la (where=(SALES<200000));
title 'small ind gc sales';

```

```

model q20b = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

output out=yhat p=yhat;

DATA yhatout;
set yhat;
p2 = yhat*yhat;
p3 = yhat*yhat*yhat;
p4 = yhat*yhat*yhat*yhat;

proc reg data=yhatout (where=(SALES<200000));
title 'small ind gc sales';
model q20b = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH p2 p3 p4;

* GC Individual equation*****;
proc reg data=la (where=(SALES>200000));
title 'large ind gc sales';
model q20b = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

output out=yhat p=yhat;

DATA yhatout;
set yhat;
p2 = yhat*yhat;
p3 = yhat*yhat*yhat;
p4 = yhat*yhat*yhat*yhat;

proc reg data=yhatout (where=(SALES>200000));
title 'large ind gc sales';
model q20b = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH p2 p3 p4;

* OR Individual equation*****;
proc reg data=la (where=(SALES<200000));
title 'small ind or sales';
model q20c = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

output out=yhat p=yhat;

DATA yhatout;
set yhat;
p2 = yhat*yhat;
p3 = yhat*yhat*yhat;
p4 = yhat*yhat*yhat*yhat;

proc reg data=yhatout (where=(SALES<200000));
title 'small ind or sales';

```

```
model q20c = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH p2 p3 p4;
```

```
* OR Individual equation*****;
```

```
proc reg data=la (where=(SALES>200000));
```

```
title 'large ind or sales';
```

```
model q20c = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;
```

```
output out=yhat p=yhat;
```

```
DATA yhatout;
```

```
set yhat;
```

```
p2 = yhat*yhat;
```

```
p3 = yhat*yhat*yhat;
```

```
p4 = yhat*yhat*yhat*yhat;
```

```
proc reg data=yhatout (where=(SALES>200000));
```

```
title 'large ind or sales';
```

```
model q20c = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH p2 p3 p4;
```

```
* ld Individual equation*****;
```

```
proc reg data=la (where=(SALES<200000));
```

```
title 'small ind ld sales';
```

```
model q20d = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;
```

```
output out=yhat p=yhat;
```

```
DATA yhatout;
```

```
set yhat;
```

```
p2 = yhat*yhat;
```

```
p3 = yhat*yhat*yhat;
```

```
p4 = yhat*yhat*yhat*yhat;
```

```
proc reg data=yhatout (where=(SALES<200000));
```

```
title 'small ind ld sales';
```

```
model q20d = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH p2 p3 p4;
```

```
* LD Individual equation*****;
```

```
proc reg data=la (where=(SALES>200000));
```

```
title 'large ind ld sales';
```

```
model q20d = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;
```

```
output out=yhat p=yhat;
```

```
DATA yhatout;
```

```
set yhat;
```

```

p2 = yhat*yhat;
p3 = yhat*yhat*yhat;
p4 = yhat*yhat*yhat*yhat;

proc reg data=yhatout (where=(SALES>200000));
title 'large ind ld sales';
model q20d = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH p2 p3 p4;

* RW Individual equation*****;
proc reg data=la (where=(SALES<200000));
title 'small ind rw sales';
model q20e = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

output out=yhat p=yhat;

DATA yhatout;
set yhat;
p2 = yhat*yhat;
p3 = yhat*yhat*yhat;
p4 = yhat*yhat*yhat*yhat;

proc reg data=yhatout (where=(SALES<200000));
title 'small ind RW sales';
model q20e = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH p2 p3 p4;

* RW Individual equation*****;
proc reg data=la (where=(SALES>200000));
title 'large ind re sales';
model q20e = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH;

output out=yhat p=yhat;

DATA yhatout;
set yhat;
p2 = yhat*yhat;
p3 = yhat*yhat*yhat;
p4 = yhat*yhat*yhat*yhat;

proc reg data=yhatout (where=(SALES>200000));
title 'large ind rw sales';
model q20e = TEL PER IN CON AD ACRES RE AGE COMPU GT3CH p2 p3 p4;

run;

```

Appendix F: Descriptive Statistics for 1998 Louisiana Nurseries

Variable	N	Mean	Std Dev	Minimum	Maximum
Q	294	147.5	85.0147	1	294
Q2	287	1983.84	12.69693	1924	1998
Q2A	290	2	0	2	2
Q3A	294	3.602041	9.164861	0	125
Q3B	294	3.316327	9.173634	0	100
Q4A1	294	0.285714	0.452524	0	1
Q4A2	22	0.954546	0.213201	0	1
Q4B1	294	0.306122	0.461667	0	1
Q4B2	29	1.034483	0.185695	1	2
Q4C1	294	0.173469	0.379298	0	1
Q4C2	38	0.973684	0.162221	0	1
Q4D1	294	0.102041	0.303218	0	1
Q4D2	22	0.954546	0.213201	0	1
Q4E1	294	0.112245	0.316206	0	1
Q4E2	26	1	0	1	1
Q4F1	294	0.034014	0.181573	0	1
Q4F2	9	0.888889	0.333333	0	1
Q4G1	294	0.20068	0.401192	0	1
Q4G2	28	1	0	1	1
Q4H1	294	0.190476	0.393346	0	1
Q4H2	21	1	0	1	1
Q4I1	294	0.05102	0.220415	0	1
Q4I2	16	1	0	1	1
Q4J1	294	0.05102	0.220415	0	1
Q4J2	31	0.967742	0.179605	0	1
Q4K1	294	0.047619	0.213322	0	1
Q4K2	19	1.105263	0.458832	1	3
Q4L1	294	0.017007	0.129517	0	1
Q4L2	1	1	.	1	1
Q4M1	0	.	.	.	.
Q4M2	0	.	.	.	.
Q5A	294	8.07483	18.13227	0	100
Q5B	294	3.302721	8.229651	0	70
Q5C	294	8.353742	16.7221	0	90
Q5D	294	3.595238	9.667304	0	90
Q5E	294	2.823129	10.78154	0	100
Q5F	294	8.057823	15.67721	0	75
Q5G	294	6.544218	19.27535	0	100
Q5H	24	8.458333	17.75676	1	90
Q5I	52	22.78846	30.84772	1	100
Q5J	76	41.07895	31.92064	1	100
Q5K	39	27.05128	27.56328	1	100

Variable	N	Mean	Std Dev	Minimum	Maximum
Q5L	64	26.4375	28.63557	1	100
Q5M	6	4.666667	3.141125	1	10
Q5N	28	22	31.20066	1	100
Q5O	55	25	31.11925	1	100
Q5P	29	36.27586	40.43328	1	100
Q5Q	28	63.96429	41.65509	3	100
Q6A	47	5.657447	10.0955	0.1	60
Q6B1	14	2.964286	4.240937	0.3	15
Q6B2	73	14627.1	27056.61	50	164000
Q6C1	3	1.166667	0.763763	0.5	2
Q6C2	25	24519.92	49051.57	200	182548
Q6D1	57	42.3193	89.13416	0.1	600
Q6D2	0	.	.	.	.
Q6E1	4	2.5	1.732051	1	5
Q6E2	9	14712.78	32464.45	240	100000
Q6F	294	3.714286	13.44668	0	160
Q6G1	294	0.158503	0.873449	0	10
Q6G2	294	4181.25	33594.47	0	509000
Q6H1	7	3.142857	2.544836	1	8
Q6H2	54	22830.26	33312.85	600	140000
Q7A	22	73.90909	39.31062	1	100
Q7B	11	14.18182	9.816498	1	30
Q7C	46	50.36957	37.14857	5	100
Q7D	2	17.5	17.67767	5	30
Q7E	244	92.65984	19.31617	10	100
Q7F	2	55	7.071068	50	60
Q7G	3	58.33333	38.18813	25	100
Q7H	21	74.85714	33.78503	2	100
Q7I	0	.	.	.	.
Q8A	294	0.404762	1.3048	0	12
Q8B	41	2.585366	3.434935	1	23
Q9	281	81.84342	18.73548	20	100
Q10	284	1.859155	0.348476	1	2
Q11A	17	10.88235	11.76798	1	50
Q11B	23	17.34783	21.80619	1	98
Q11C	294	12.43197	26.3606	0	100
Q11D	294	29.40136	35.69594	0	100
Q11E	294	12.82653	26.92159	0	100
Q11F	294	36.01361	38.79464	0	100
Q11G	20	42.9	36.48633	2	100
Q12A	294	4.295918	1.184737	0	5

Variable	N	Mean	Std Dev	Minimum	Maximum
Q12B	274	3.135037	1.566597	1	5
Q12C	282	4.375887	0.987747	1	5
Q12D	280	3.632143	1.460484	1	5
Q12E	285	3.891228	1.423678	1	5
Q12F	294	3.619048	1.444459	1	5
Q12G	280	4.017857	1.25711	1	5
Q12H	281	3.117438	1.353731	0	5
Q12I	276	3.101449	1.373991	1	5
Q12J	276	2.945652	1.380625	0	5
Q12K	294	2.836735	1.671037	1	5
Q12L	294	3.421769	1.65414	1	5
Q13A2	201	66.41791	35.77114	1	100
Q13B2	172	37.07558	28.83001	1	100
Q13C2	116	20.76724	17.85222	1	80
Q13D2	68	15.29412	11.39266	1	60
Q13E2	42	10.90476	7.267735	1	37
Q13F2	27	17.25926	18.45284	1	90
Q14A	138	9.202899	9.464617	1	60
Q14E	224	17.38393	11.17592	1	60
Q14I	159	7.81761	7.245125	1	60
Q14B	170	12.54706	10.90739	1	75
Q14F	172	9.325581	8.165599	1	50
Q14J	172	10.14535	7.010171	1	50
Q14C	237	20.23207	12.03741	1	90
Q14G	129	6.186047	5.775443	1	35
Q14K	160	9.825	7.152033	1	40
Q14D	241	23.76349	13.98623	1	90
Q14H	122	5.581967	5.52506	1	40
Q14L	145	9.917241	9.377502	1	80
Q15A	294	1.979592	0.141633	1	2
Q15B	5	1.8	1.303841	1	4
Q15C	287	1.937282	0.242878	1	2
Q16Ax	294	74.12585	31.6012	0	100
Q16Az	172	42.48256	29.51904	1	100
Q16A2	164	68.94512	28.78123	5	100
Q16B2	110	26	18.27767	5	95
Q16C2	72	13.84722	7.518353	4	33
Q16D2	45	12.22222	8.417754	2	45
Q16E2	30	9.366667	6.599286	1	30
Q16F2	17	23.82353	25.63502	5	90
Q17A	292	1.65411	0.476474	1	2

Variable	N	Mean	Std Dev	Minimum	Maximum
Q17B	93	26.22581	25.39177	1	100
Q18	294	7.408163	19.68203	0	100
Q18A	22	1	0	1	1
Q18B	42	1	0	1	1
Q18C	15	1	0	1	1
Q18D	6	1	0	1	1
Q18E	41	1	0	1	1
Q19A	274	83.79197	30.23468	1	100
Q19B	114	55.62281	37.49157	1	100
Q20A	294	5	17.0952	0	100
Q20B	294	24.55782	32.17669	0	100
Q20C	294	6.982993	21.18381	0	100
Q20D	294	31.5102	33.3449	0	100
Q20E	294	23.10544	34.06217	0	100
Q21A2	41	72.65854	33.71766	1	100
Q21B2	23	27.86957	21.01364	5	80
Q21C2	14	17.21429	11.52375	2	45
Q21D2	10	10.5	3.689324	5	15
Q21E2	7	9.142857	5.490251	4	20
Q21F2	6	11.66667	7.527727	5	20
Q22A2	149	78.83221	28.12938	1	100
Q22B2	75	32.29333	25.07005	1	100
Q22C2	42	12.90476	14.73309	1	95
Q22D2	24	10.20833	6.227423	2	25
Q22E2	17	7.058824	4.084584	3	20
Q22F2	13	25	17.79513	5	60
Q23A2	60	80.41667	28.60146	10	100
Q23B2	22	29.09091	16.6645	10	75
Q23C2	12	11.25	6.077155	5	20
Q23D2	8	8.75	4.432026	5	15
Q23E2	8	6.875	2.587746	5	10
Q23F2	10	27.5	25.84677	5	70
Q24A2	185	73.86486	30.90744	1	100
Q24B2	103	33.97087	25.06441	1	100
Q24C2	53	16.15094	10.53273	5	50
Q24D2	30	9.766667	5.963587	2	25
Q24E2	13	6.538462	4.074624	1	15
Q24F2	16	31.375	28.46489	2	90
Q25A2	121	69	34.47269	1	100
Q25B2	81	41.61728	29.79579	2	100
Q25C2	52	18.25	12.56181	3	75

Variable	N	Mean	Std Dev	Minimum	Maximum
Q25D2	29	10.93103	6.551614	2	25
Q25E2	15	7.266667	5.586549	2	25
Q25F2	11	18.63636	20.25968	5	75
Q26A	286	4.423077	0.976581	1	5
Q26B	277	3.256318	1.306064	1	5
Q26C	286	3.643357	1.261609	1	5
Q26D	294	4.217687	1.135929	1	5
Q26E	284	4.28169	1.028679	1	5
Q26F	294	3.751701	1.296983	1	5
Q26G	294	3.612245	1.39941	1	5
Q26H	283	3.254417	1.315055	0	5
Q26I	10	3.1	1.911951	0	5
Q27A	273	4.021978	1.300266	1	5
Q27B	271	3.845019	1.225487	1	5
Q27C	269	3.843866	1.309327	1	5
Q27D	272	4.154412	1.092603	1	5
Q27E	271	3.907749	1.337069	1	5
Q27F	272	3.713235	1.31922	1	5
Q28	294	2.183674	5.625418	0	50
Q28A	18	24.22222	29.74708	1	100
Q28B	37	49.48649	38.70014	1	100
Q28C	10	40.3	39.11252	3	100
Q28D	5	29.8	20.005	4	50
Q28E	35	55.45714	31.72802	10	100
Q28F	15	53	39.08781	5	100
Q28G	26	45.03846	37.28858	1	100
Q28H	41	54.36585	30.95299	10	100
Q28I	59	66.86441	36.86203	3	100
Q29	293	341638.2	980646.7	0	7500000
DIVERSE	294	40.7517	44.92181	0	100
Q5HORT	130	71.35385	34.6139	1	100
AGE	287	15.16028	12.69693	1	75
ACRES	294	3.968777	13.83773	0	160.1837
EMPLOY	294	6.918367	15.10148	0	140
COMP	294	1.537415	2.443273	0	10
SALES	293	341638.2	980646.7	0	7500000
TEL	293	19957167	71359053	0	6.75E+08
PER	293	10344113	37381463	0	4.5E+08
IN	293	20314420	65728315	0	7.5E+08
CON	293	4238481	19677057	0	1.63E+08
AD	293	864931.7	4324954	0	45000000

Variable	N	Mean	Std Dev	Minimum	Maximum
RE	280	28456518	82384696	0	7.5E+08
DUM1	294	0.557823	0.497492	0	1
DUM2	294	0.370748	0.483829	0	1
DUM3	294	0.472789	0.50011	0	1
DUM4	294	0.272109	0.445805	0	1
DUM5	294	0.411565	0.492956	0	1
DUM6	294	0.64966	0.47789	0	1
COMPU	294	0.278912	0.449229	0	1
DUMa	294	0.129252	0.33605	0	1
DUMb	294	0.52381	0.500284	0	1
DUMc	294	0.197279	0.398623	0	1
DUMd	294	0.659864	0.474563	0	1
DUMe	294	0.455782	0.49889	0	1
GT3CH	294	0.095238	0.294044	0	1

Appendix G: Descriptive Statistics for 1998 Gulf States Nurseries

Variable	N	Mean	Std Dev	Minimum	Maximum
Q	248	47.59274	30.808	1	112
Q2	241	1977.88	16.60064	1916	1998
Q2A	247	1.94332	0.2317	1	2
Q3A	248	16.8871	34.69572	0	250
Q3B	248	14.39113	44.91337	0	500
Q4A1	248	0.685484	0.465262	0	1
Q4A2	6	1	0	1	1
Q4B1	248	0.649194	0.478188	0	1
Q4B2	17	1	0	1	1
Q4C1	248	0.46371	0.49969	0	1
Q4C2	32	1	0	1	1
Q4D1	248	0.229839	0.42158	0	1
Q4D2	18	1	0	1	1
Q4E1	248	0.28629	0.452941	0	1
Q4E2	37	1	0	1	1
Q4F1	248	0.092742	0.290657	0	1
Q4F2	12	1	0	1	1
Q4G1	248	0.479839	0.500604	0	1
Q4G2	18	1	0	1	1
Q4H1	248	0.459677	0.499379	0	1
Q4H2	9	1	0	1	1
Q4I1	248	0.048387	0.215017	0	1
Q4I2	13	1	0	1	1
Q4J1	248	0.201613	0.402016	0	1
Q4J2	25	1	0	1	1
Q4K1	248	0.092742	0.290657	0	1
Q4K2	19	1	0	1	1
Q4L1	248	0.020161	0.140836	0	1
Q4L2	2	1	0	1	1
Q4M1	1	1	.	1	1
Q4M2	0	.	.	.	.
Q5A	248	16.00403	25.81803	0	100
Q5B	248	4.266129	10.4789	0	100
Q5C	248	11.85484	20.04133	0	100
Q5D	248	4.495968	11.06038	0	90
Q5E	248	9.233871	21.83175	0	100
Q5F	248	5.391129	14.9911	0	100
Q5G	248	3.681452	13.68232	0	100
Q5H	39	15.66667	30.73086	1	100
Q5I	69	22.6087	30.85031	1	100
Q5J	65	39.30769	33.22176	1	100
Q5K	43	12.97674	22.22021	1	100

Variable	N	Mean	Std Dev	Minimum	Maximum
Q5L	45	21.31111	23.923	1	100
Q5M	18	19.38889	32.2073	1	100
Q5N	20	12.75	19.80132	1	75
Q5O	34	21.02941	30.92952	1	100
Q5P	40	22.95	32.0344	1	100
Q5Q	40	57.45	43.36544	0	100
Q6A	40	167.525	481.7589	0.1	2167
Q6B1	22	16.40455	63.40126	0.1	300
Q6B2	61	32511.67	69404.84	500	454000
Q6C1	6	3.833333	1.47196	2	6
Q6C2	29	17659.59	27889.47	100	120000
Q6D1	84	123.2131	290.29	0.5	1700
Q6D2	0	.	.	.	.
Q6E1	5	2.5	1.658312	0.5	4
Q6E2	4	66000	84667.98	3000	186000
Q6F	248	9.474194	26.42644	0	200
Q6G1	248	1.128226	5.513936	0	50
Q6G2	248	11233.11	51376.47	0	560000
Q6H1	9	9.277778	9.367868	0.5	25
Q6H2	28	61152.14	94964.42	200	500000
Q7A	36	42.19444	41.45691	1	100
Q7B	22	19.63636	28.06548	1	100
Q7C	60	48.55	41.53595	1	100
Q7D	1	10	.	10	10
Q7E	192	85.59896	27.55519	2	100
Q7F	14	19.21429	30.48626	1	95
Q7G	10	21.8	31.01183	1	100
Q7H	23	65.3913	41.14911	5	100
Q7I	0	.	.	.	.
Q8A	248	1.5	2.97765	0	25
Q8B	74	2.432432	1.655883	1	8
Q9	240	88.15	74.55067	2	982
Q10	242	1.760331	0.427766	1	2
Q11A	40	10.525	11.33406	1	50
Q11B	51	14.15686	17.48413	1	100
Q11C	248	15.61694	26.24307	0	100
Q11D	248	31.10887	34.15374	0	100
Q11E	248	15.69355	26.73855	0	100
Q11F	248	22.65323	30.83535	0	100
Q11G	21	26.61905	32.95979	1	100
Q12A	248	4.185484	1.056056	1	5

Variable	N	Mean	Std Dev	Minimum	Maximum
Q12B	240	2.804167	1.396043	1	5
Q12C	246	4.243902	0.941917	1	5
Q12D	245	3.759184	1.255793	1	5
Q12E	243	3.658436	1.435457	1	5
Q12F	248	3.560484	1.339365	1	5
Q12G	242	3.797521	1.168534	1	5
Q12H	246	3.186992	1.214535	1	5
Q12I	243	3.17284	1.241069	1	5
Q12J	242	3.243802	1.195801	1	5
Q12K	248	3.149194	1.4362	0	5
Q12L	248	3.685484	1.384512	0	5
Q13A2	168	53.3869	34.2161	1	100
Q13B2	156	39.91667	26.84386	1	100
Q13C2	125	16.744	13.46435	1	85
Q13D2	76	12.97368	11.99219	1	60
Q13E2	47	9.765957	8.000578	1	40
Q13F2	32	17.375	25.58824	1	100
Q14A	162	7.691358	8.065943	1	40
Q14E	188	15.06383	8.718176	1	50
Q14I	159	7.45283	5.067516	1	31
Q14B	173	11.04046	9.276351	1	40
Q14F	167	8.820359	5.640116	1	40
Q14J	176	9.744318	7.515125	1	50
Q14C	192	15.90104	10.26179	2	75
Q14G	144	5.576389	3.465272	1	20
Q14K	176	8.738636	7.349238	1	50
Q14D	191	20.05759	12.86701	2	75
Q14H	139	5.223022	3.55504	1	25
Q14L	164	9.652439	11.69898	1	85
Q15A	247	1.91498	0.279478	1	2
Q15B	20	3.5	4.524786	1	20
Q15C	237	1.902954	0.296648	1	2
Q16Ax	248	78.69758	29.4034	0	100
Q16Az	145	35.05517	29.80277	1	96
Q16A2	125	51.496	29.85411	2	100
Q16B2	111	22.33333	16.19671	1	80
Q16C2	86	14.40698	8.812261	1	50
Q16D2	62	10.01613	5.664071	1	25
Q16E2	44	9.136364	5.845256	1	25
Q16F2	40	33.05	23.66101	2	97
Q17A	244	1.557377	0.497718	1	2

Variable	N	Mean	Std Dev	Minimum	Maximum
Q17B	109	29.78899	29.26478	1	100
Q18	248	16.16935	28.09807	0	100
Q18A	50	1	0	1	1
Q18B	67	1	0	1	1
Q18C	30	1	0	1	1
Q18D	6	1	0	1	1
Q18E	63	1	0	1	1
Q19A	233	83.58798	28.81215	1	100
Q19B	115	43.68696	36.97661	1	100
Q20A	248	8.991936	22.70369	0	100
Q20B	248	24.86694	31.18877	0	100
Q20C	248	5.233871	15.54573	0	100
Q20D	248	32.91935	35.60014	0	100
Q20E	248	21.53629	31.01441	0	100
Q21A2	51	70.29412	31.55205	5	100
Q21B2	36	21.77778	18.84085	2	100
Q21C2	28	14.07143	9.999735	1	50
Q21D2	19	10.52632	6.086127	2	20
Q21E2	13	9.307692	5.80782	3	20
Q21F2	14	22.57143	22.32527	2	72
Q22A2	148	82.77703	26.60311	10	100
Q22B2	62	23.91935	22.22559	1	100
Q22C2	41	11.34146	7.568387	1	33
Q22D2	24	12.125	10.46864	2	50
Q22E2	18	7.777778	5.374839	1	20
Q22F2	16	29.375	28.80712	5	100
Q23A2	65	84.89231	24.83642	10	100
Q23B2	24	20.58333	19.03981	2	70
Q23C2	18	10.66667	6.534974	1	25
Q23D2	14	6.642857	4.482567	1	16
Q23E2	10	7.5	5.016639	1	16
Q23F2	6	21.33333	25.03331	5	70
Q24A2	170	90.54706	19.63756	5	100
Q24B2	57	19.12281	19.62876	1	100
Q24C2	32	9.21875	8.392525	1	33
Q24D2	20	7	5.078334	1	20
Q24E2	11	7.272727	3.227721	2	10
Q24F2	11	9.272727	8.161996	1	31
Q25A2	126	83.43651	27.32749	1	100
Q25B2	55	19.6	16.07459	1	65
Q25C2	38	12.57895	10.07709	1	40

Variable	N	Mean	Std Dev	Minimum	Maximum
Q25D2	27	8.814815	6.569376	1	30
Q25E2	19	7.842105	4.633971	2	20
Q25F2	19	18.10526	22.76668	2	100
Q26A	237	4.367089	0.936689	1	5
Q26B	236	3.004237	1.11278	1	5
Q26C	239	3.648536	1.062099	1	5
Q26D	248	4.032258	1.200105	0	5
Q26E	241	4.219917	0.920472	1	5
Q26F	248	3.794355	1.267009	1	5
Q26G	248	3.322581	1.220927	1	5
Q26H	242	3.132231	1.08511	1	5
Q26I	16	3	1.966384	0	5
Q27A	233	3.472103	1.377261	1	5
Q27B	232	3.478448	1.116372	1	5
Q27C	233	3.665236	1.166871	1	5
Q27D	230	3.8	1.130753	1	5
Q27E	231	3.593074	1.288324	1	5
Q27F	223	3.35426	1.194985	1	5
Q28	248	3.290323	6.780866	0	75
Q28A	43	15.30233	22.05894	1	90
Q28B	71	33.71831	33.5117	1	100
Q28C	17	14.88235	13.28948	2	50
Q28D	7	17.28571	14.59126	1	40
Q28E	83	43.15663	29.90003	3	100
Q28F	45	27.11111	25.03018	2	100
Q28G	32	32.375	33.77416	1	100
Q28H	92	41.44565	30.09011	2	100
Q28I	61	49.72131	35.28179	3	100
Q29	248	1527117	2639859	0	12500000
DIVERSE	248	54.92742	43.89556	0	100
Q5HORT	133	56.85714	39.31326	1	100
AGE	241	21.12033	16.60064	1	83
ACRES	248	10.8603	29.52598	0	250
EMPLOY	248	31.27823	72.71111	0	700
COMP	248	3.616936	2.735735	0	10
SALES	248	1527117	2639859	0	12500000
TEL	248	73479435	1.53E+08	0	9.5E+08
PER	248	61554940	1.69E+08	0	1.25E+09
IN	248	96170665	1.82E+08	0	1.25E+09
CON	248	35295766	1.09E+08	0	1.19E+09
AD	248	4056754	9389850	0	75000000

Variable	N	Mean	Std Dev	Minimum	Maximum
RE	240	1.37E+08	2.39E+08	0	1.19E+09
DUM1	248	0.431452	0.49628	0	1
DUM2	248	0.375	0.485102	0	1
DUM3	248	0.318548	0.466856	0	1
DUM4	248	0.221774	0.41628	0	1
DUM5	248	0.366936	0.482943	0	1
DUM6	248	0.508065	0.500946	0	1
COMPU	248	0.633065	0.482943	0	1
DUMa	248	0.221774	0.41628	0	1
DUMb	248	0.66129	0.474228	0	1
DUMc	248	0.25	0.433888	0	1
DUMd	248	0.729839	0.444941	0	1
DUMe	248	0.584677	0.493774	0	1
GT3CH	248	0.209677	0.407902	0	1

Appendix H: 1998 Gulf States Nurseries Descriptive Tables

H.1 – Average Monthly Sales for Small and Large Nurseries, Gulf States, 1998.

Sales Category (\$)	Number of Observations
Less than \$50,000	41
\$50,000 - \$ 99,999	22
\$100,000 - \$ 249,999	26
\$250,000 - \$ 499,999	34
\$500,000 - \$ 999,999	35
\$1,000,000 - \$1,999,999	26
\$2,000,000 - \$2,999,999	19
\$3,000,000 - \$3,999,999	10
\$4,000,000 - \$4,999,999	8
\$5,000,000 - \$9,999,999	10
\$10,000,000 or above	0

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

H.2 – Age, Employment and Total Sales for Small and Large Nurseries, Gulf States, 1998.

	Size by	No. of	Average Year	Average No. of Employees		Average
Category	Sales(\$)	Obs.	Established	Permanent	Temporary	Total Sales (\$)
Small	< \$200k	89	1982.4	2.03	2.38	81,180
Large	> \$200k	142	1975.0	21.54	14.19	1,911,971

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

H.3 – Average Percentage of Sales by Marketing Channel for Small and Large Nurseries, Gulf States, 1998.

		Marketing Channels				
	Size by Sales (\$)	Mass Merchandise	Garden Center	Re- Wholesaler	Landscaper	'Other' Retailer
Small	< 200k	4.43	34.48	20.86	33.71	6.52
Large	> 200k	12.01	21.29	24.82	36.65	5.22

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

H.4 – Total Industry Sales (\$) by Marketing Channel for Small and Large Nurseries, Louisiana, 1998.

Size by Sales (\$)	Marketing Channels					'Other' Retailer
	Mass Merchandiser	Garden Center	Re- Wholesaler	Landscaper		
Small < 200k	320,095	2,491,253	1,507,190	2,435,465		470,997
Large > 200k	32,619,926	57,813,529	67,375,919	99,516,728		14,173,897

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

H.5 - Average Monthly Sales for Small and Large Nurseries, Louisiana, 1998.

Month	Percentage of Total Sales (%)	
	Small < \$200k	Large > \$200k
January	5.07	5.77
February	7.79	9.29
March	13.60	14.01
April	19.06	16.24
May	13.31	12.80
June	7.23	6.47
July	3.28	3.94
August	2.70	3.73
September	4.98	5.84
October	7.60	8.25
November	7.36	6.99
December	8.00	6.80

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

H.6 – Percentage of Total Sales by Plant Category for Small and Large Nurseries, Louisiana, 1998.

Plant Category	Percentage of Total Sales (%)	
	Small < \$200k	Large > \$200k
Deciduous Shade and Flowering Trees	18.66	14.12
Deciduous Shrubs	5.98	3.40
Broad-leaved Evergreen Shrubs	11.29	11.48
Narrow-leaved Evergreen Shrubs	3.75	4.99
Evergreen Trees	9.88	9.25
Azaleas	7.39	4.44
Vines and Ground Covers	2.61	4.46
Bedding Plants – Annuals	4.89	13.43
Other	35.55	34.43

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

H.7 - In-State and Out-of-State Sales and Advertising Expenditure
As a Percentage of Total Sales, Small and Large Nurseries, Louisiana, 1998

	Size by Sales	In-State %	Out-of-State %	Advertising %	Advertising (\$)
Small	< 200k	91.08	8.92	4.69	3,803
Large	> 200k	72.20	27.80	2.72	51,973

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

H.8 – Percentage of Computer Use for Small and Large Nurseries, Louisiana, 1998.

Computer Function	Percentage Using Function (%)	
	Small < \$200k	Large > \$200k
Word Processing	51.69	79.58
Accounting	35.96	81.69
Inventory	30.34	57.75
Financial Investments	10.11	32.39
Web Pages	19.10	34.51
CDs	2.25	14.79
e-mail	37.08	54.93
Faxing	25.84	59.86
Landscape Design	8.99	2.82
Production Scheduling	3.37	29.58
Greenhouse Production	1.12	14.08
Controls		

Source: Producer survey on Trade Flows and Marketing Practices and Census of Horticultural Specialties

Vita

Wade R. Hampton graduated from the University of Florida in 1994 with a bachelor of arts degree in English and a minor in business administration. After working for several years, in 1998 he enrolled in Louisiana State University to pursue a masters of science degree in agricultural economics. While at Louisiana State University, Wade served as President of the Agricultural Economics Graduate Student Association. Wade currently works for the United States Department of Agriculture's Economic Research Service as an Economic Information Specialist. He will receive the degree of Master of Science in December, 2001.